FOOD MANUFACTURE

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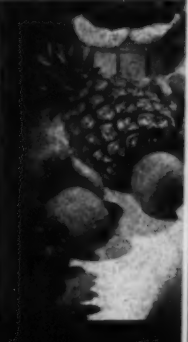

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FOOD MANUFACTURE

Incorporating Canning, Packing and Preserving.

VOLUME . . . XV

NUMBER . . . 5

MAY 3, 1940

Jam and Fruit Products Number

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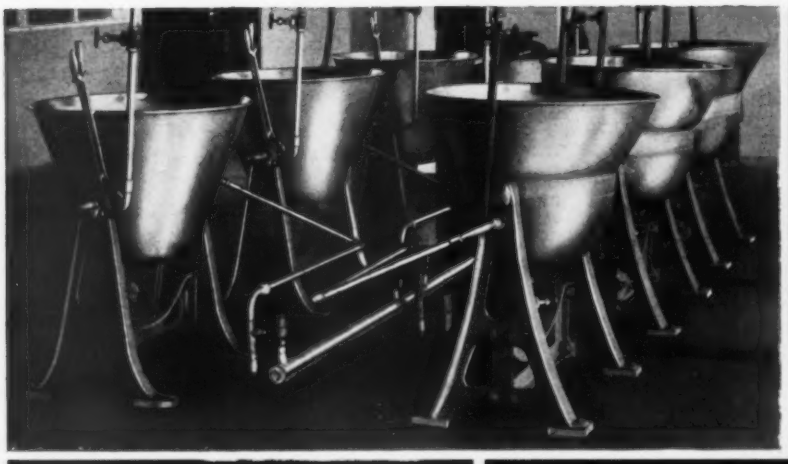
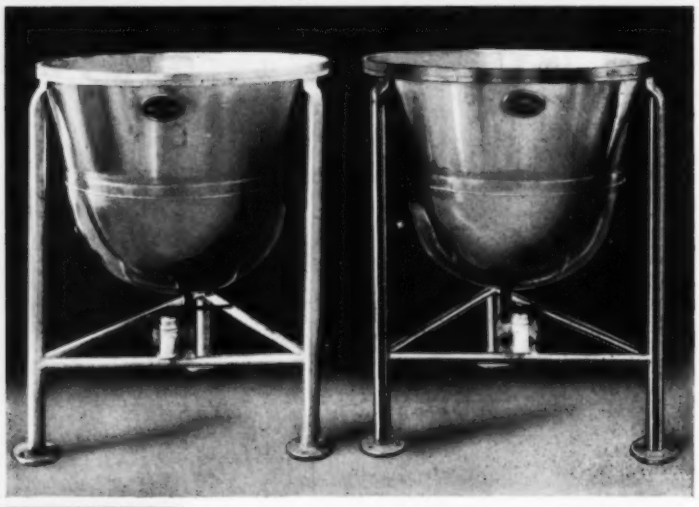
The Editor will be glad to consider contributions from those engaged in the Food Industry. Articles intended for publication should be of a practical nature and accompanied by photographs or drawings when possible.

STEAM PANS





Top Left : *A battery of Stainless Steel Jam Boiling Pans. By the courtesy of Messrs. Redman, Ltd., Manchester.*

Top Right : *100-gallon Standard Pan.*

Centre Left : *110-gallon Nickel Pan with agitator.*

Centre Right : *50-gallon Stainless Steel Pans of special design, with tapered light course and bright polished finish.*

Bottom : *200-gallon Nickel Pans with Monel Metal Jackets.*

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FOOD MANUFACTURE

Vol. XV, No. 5 May 3, 1940

Dextrose in Canning

FACTORS WHICH control the substitution of dextrose for part of the sucrose used in canned fruits and vegetables have been determined by experiment by E. W. Eickelberg, Research Director of Fairmont Canning Co., Minn., U.S.A., who records his results in *Food Industries*, **12**, 1. Although in such products as vegetables there was a danger of caramelisation, in the canning of fruit there is a more favourable *p*H for dextrose, and in general there is little difference between all sucrose and dextrose-sucrose packs as far as texture, colour, etc., are concerned and the " discernible difference between fruits packed with sucrose or sucrose-dextrose sugar is to be found in the flavour and palatability ".

Nitrite and Bacon

The Provisional Regulations dated October 20, 1939, made by the Minister of Health, which make the addition of sodium or potassium nitrite to bacon and ham in its manufacture now permissible, renders doubly interesting Special Report No. 49, " The Function of Nitrate, Nitrite and Bacteria in the Curing of Bacon and Hams ", by Drs. J. Brooks, R. B. Haines, T. Moran and J. Page, issued by the Department of Scientific and Industrial Research. The results of the experiments described have furnished a reply to the vexed question as to whether the production of the " cured colour " is the sole function of the nitrite and whether the nitrates (when saltpetre is used) and the bacteria play any *rôle* apart from producing the nitrite.

The experiments appear to prove that a satisfactory English bacon can be made by the sole use of salt and nitrite in the pickle and that the bacteria and nitrate are not essential to the development of bacon flavour.

The investigation is a very important piece of work from the point of view of the bacon curer. We gather from the report that Mr. T. Macara and his colleagues have independently carried out a similar investigation and that the results obtained agree in detail with those here mentioned.

Bactericidal Action of Ultra-Violet Light

Ultra-violet light has already been practically applied as a sterilising agent in the United States in connection with the meat packing industry, as described in FOOD MANUFACTURE, April, 1939.

An interesting piece of research is described in *The Journal of Hygiene*, **40**, 2, 1940, in which Drs. D. E. Lea and R. B. Haines made experiments to determine the bactericidal action of ultra-violet light to determine the shape of the survival curve and the dependence upon radiation intensity of the rate of death. *Bacillus coli*, *B. prodigiosum* and spores of *B. mesentericus* were irradiated with approximately monochromatic light of wavelength 2,537 A. The survival curves obtained were exponential and the rate of death was accurately proportional to the intensity over an intensity range of 500 : 1.

By comparing these results with data previously obtained of the action of X-rays on the same organisms, it was established that one ionisation produced by X-rays is as effective as some hundreds of ultra-violet quanta. This is interpreted to mean that the quantum yield in whatever chemical change leads to the loss of viability in the irradiated bacteria is, for 2,537 A., between 0·01 and 0·001.

Feeding Stuffs

The late Minister of Food, Mr. W. S. Morrison, recently addressed the Farmers Club on the question of animal feeding stuffs. As a previous Minister of Agriculture one would expect him to speak on this subject as one having authority and not as the scribes. One fears, however, that the

farmers were about as wise after the address as before, but perhaps a little more confused. Mr. Morrison explained that every inch of available storage space for grain was full with wheat at the outbreak of war. Fine words, indeed, but he did not tell us how much storage space was available. He and his predecessors had plenty of warning about providing storage for food long before the war. Perhaps he did not see the article in this Journal in April, 1936, by T. H. Fairbrother, entitled "Are We Prepared?" He said that before the war, when he took over the duty of supervising food, there were plans to build new silos for storage of feeding stuffs, but these took time to construct, and as the situation turned out the wheat had to come first. All we can say is that this Journal urged the Government to take action four years ago, and a whole heap of silos could have been built in that time, and we could now have had both the wheat for our bread and the food for our animals.

Agricultural Policy

Mr. De la Bere has acquired a reputation for asking irrelevant and often fatuous questions in the House of Commons, particularly in regard to the milling industry, but his queries about the Government's long-term agricultural policy were most apposite. He asked for a statement as to whether the Government had any concrete plan for the future in connection with the newly ploughed up land, and whether, after the war, this would revert to grass. The Minister of Agriculture gave as evasive a reply as would have done credit to his immediate predecessors and refused to give any information at all. All he could say was that agriculture is a complicated matter, as it involves a number of industries—so he, like previous ministers, has discovered that! Doubtless he wishes to learn the views of the National Farmers Union before committing himself to any statement on long-term policy. This may be convenient to him, but members of the House, and the public in general, have the right to demand information on this most important subject.

Food from Straw

The Egyptians used to employ straw for making bricks, but Imperial Chemical Industries have gone one better and have evolved a method whereby straw can be converted into a valuable animal food by treatment with caustic soda. Lord McGowan referred to this recently in a letter to *The Times*, but it is not a new process and it is doubtful whether it would be a commercial proposition in peace-time, although it certainly has possibilities in war-time.

The process depends on the fact that dilute caustic soda breaks down the indigestible cellulose in the straw and, therefore, releases the digestible elements. It is really a predigestion process. The product is eaten readily by all livestock and has a substantial food value. Many tests have been carried out and a demonstration plant has been working at Jealott's Hill.

How to apply the process is the difficulty, and either small plants could be made for use by individual farmers or large ones erected in conjunction with existing factories employed in producing cattle food. In view of the Government's failure to provide for feeding stuffs in the normal way, it will be interesting to see whether they take any notice of this discovery and develop it immediately for the benefit of harassed stock-breeders.

Swine Sickness

It is generally admitted that the diagnosis of pig diseases is difficult, and any contribution to our knowledge of the subject is vitally important, particularly at the present time when pig production is a matter of national importance.

A paper of considerable interest was recently presented to the Central Veterinary Society by B. A. Claxton, M.R.C.V.S. He made no claim for originality, but his paper provoked a useful discussion in which many personal experiences were related, and an ounce of practical experience is worth a ton of theoretical speculation.

Avoidable losses in pig farming are enormous and mainly caused by a lack of the elementary principles of hygiene, a lamentable absence of common sense and a deplorable trust in quacks and "cure-alls". The future of pig farming in this country is difficult to foresee. In the past cheap feeding stuffs in unlimited quantities have been used to produce the "forced feeding" type of pig, and a high rate of weight gain has been obtained at the expense of disease resistance, and it is of national importance that this system should be replaced by one which will produce hardier and more resistant pigs.

Chlorate Poisoning

The use of sodium chlorate for the control of weeds is increasing, and with it is a growing danger of animal poisoning.

McCulloch and Murer have recently published a paper in America on this subject. In it is given a

useful review of the literature on the subject, and it is stated that the approximate lethal doses for horses are 250 grams, cows 500 grams, sheep 100 grams and dogs 60 grams. The lethal dose for chickens is as low as 5 mg. per gram bodyweight. No successful antidote has been found, and reducing agents such as sodium thiosulphate or calcium gluconate had no beneficial effect. Three cases of poisoning are described in range cattle and sheep on pasture which had been treated with chlorate to destroy thistles. The only practical suggestions made are that mineral licks should be provided for the animals, the chlorate should be in complete solution and should not be applied at more than 5 lbs. per square rod.

The Progress of Rationing

We have been assured by the Government spokesmen that our food supply, no matter how long the war lasts, will be adequate for everybody and the flexibility of the arrangements will secure fairness all round, and that there will be no queues such as there were during the last war. This sounds good, and we wish it were as true as it purports to be, but there is no doubt that the rationing of some foodstuffs has not worked at all smoothly. We agree that the job of feeding 40,000,000 people is gigantic, and we appreciate the efforts made by the Food Ministry, but we feel that too much attention has been paid to everyone getting an equal share. Everyone does not want the same, and some people cannot afford to pay as much as others. The fixing of the price of butter at 1s. 7d. per lb. did more than the ration card could ever do. It stopped a large number of butter eaters from buying it and they turned to good margarine at 8d. per lb. The result was a surplus of butter that some people would have gladly purchased but were not allowed to do so. Meat again has caused much heartburning, and many housewives will want to change their butchers when the new ration books come in on July 8, but it is not the butchers who are to blame —it is the system. Why is it that in Manchester one day we saw a notice on a leading shop window "Offals Galore", but on returning to London had the utmost difficulty in getting a couple of kidneys?

Chlorophyll in Foodstuffs

In 1934 N. T. Deleanu and J. Dick published a method for the determination of chlorophyll which was based on estimation of the amount of magnesium in the chlorophyll fraction. A method which in its initial stages somewhat resembles Deleanu's has just been published in *Annales Agronomiques* by M. Javillier and S. Goudchaux, who state that they have been using it for several years and were unaware of the existence of the other method. A number of analytical results are included in the French paper, and of the materials examined none had a higher content of chlorophyll-magnesium per unit of dry matter than well-grown wheat plants, though the leaves of asparagus run wheat very close. In all species, only a small proportion of the total magnesium was present as chlorophyll. Spinach had relatively little chlorophyll at any stage of growth, while the outer leaves of lettuce had less still, and the blanched leaves practically none. The authors point out that their method allows of changes in amounts of chlorophyll during processing to be followed. They allege that during canning the chlorophyll of spinach disappears entirely. It would be interesting to know whether chlorophyll disappears from green vegetables after they have been picked; if it does, the determination of chlorophyll may offer an index of freshness—for which we possess as yet no quantitative method of expression.

Professional Interest in Canned Food

"The need of the medical, dental, nursing, home economics and dietetic professions for special information on commercially canned foods has long been recognised." In an interesting paper read before the National Canners Association at Chicago, M. A. Hoy and R. W. Pilcher summarised the experiences gained and observations made during the past four and a half years of this type of advertising. It is somewhat surprising to read that the authors found that in contacts with consumer complaints they were impressed not only by the degree of prejudice with which many lay consumers regarded commercially canned foods but also by the general lack of information on the part of dentists, physicians and nurses regarding this class of food, particularly with reference to their safety and wholesomeness. It was by reason of this that in 1935 the American Can Company started the practice of issuing monthly educational releases on canned foods in the major journals serving the medical, dental, nursing, dietetic and home economic professions.

In their paper the authors covered many aspects of the campaign, including the selection of topic material, the changing aspect of professional interests and other matters. They also stressed the necessity for further research. For instance, they

suggested that there was a very great need for a table giving the mineral values of canned foods, which was at present not available. Presentation of the complete facts about canned foods is a long range project and the end is not yet in sight.

There is no reason to believe that the consumer in this country is more "educated" as regards canned foods than his American counterpart, and the authors in their paper are certainly very convincing in their plea that there is still much to be done.

Wheat for Animals?

Recently it was announced that a certain amount of wheat would be released for stock feeding, and Sir Daniel Hall strongly questioned the wisdom of this action. The proposition was warmly welcomed by pig producers and poultry keepers, and undoubtedly, coming at the time when pullets are being reared, it was a boon and a blessing to the latter industry. It has always been the custom to feed wheat to chickens, and much of the wheat produced in this country is not fit for anything else. In normal times, wheat not suitable for milling will often fetch more money for poultry than for flour milling. Sir Daniel Hall would do well to remember that man cannot, and does not want to, live by bread alone, and the hen is able to convert grain into a palatable and nutritious food in the form of eggs during her lifetime, and when her day is over she is a useful pot boiler. There is no apparent shortage of wheat, but there is a definite lack of feeding stuffs. As it is, fewer poultry have been reared this spring, and if there had not been a release of wheat for those that have been hatched the egg situation would have been very serious next winter.

How Cold should Ice-Cream be Served?

A study was undertaken at the University of Missouri to attempt to answer this question, and it was found that serving temperature was of decided importance in determining consumer acceptance of frozen desserts. Ice-creams served at 10° F. were considered by a large percentage of judges as being desirable in flavour, smooth and mellow in body, and close in texture. Those served at 14° were slightly objectionable, because of the tendency for the flavour to be pronounced, sweet and "warm". The body tended to be lacking in resistance, and the texture was somewhat open. Creams served at 6° were criticised severely for having a cold submerged flavour and resistant body. Those served at 18° were less desirable than any of the above, so it appears that a temperature close to 10° is the best. Having a higher sugar content and a more pronounced flavour, sherbets were preferred served at a temperature slightly below 10°. Serving temperatures appeared to have little effect upon the stability of ice-cream, but it is interesting to note that ice-cream became undesirable for consumption more rapidly when the smaller-sized dippers were used.

Boron Compounds in Foods

Boron compounds in foods are prohibited in many countries, which indicates a fairly unanimous opinion on its effects on health. According to a recent order by the Minister of Health, borax can now be added to our bacon. We recognise that special conditions require special measures, but we hope that the practice of using preservatives will not be extended, as, apart from their possible effect on the human body, reliance upon them tends to reduce care in manufacture.

Cheese Standards

A prosecution brought against a firm for selling cheese to the prejudice of the purchaser was recently dismissed at Ely. Three packets of cheese were sold to an inspector and were sent for analysis. The analyst reported that it contained 23 per cent. excessive moisture. The prosecution urged that the Society of Public Analysts had pressed for a maximum of 42 per cent. moisture in such cheeses. They had been backed by the Food Manufacturers Federation, but the Ministry of Food had not yet made any decision.

Public analysts of the reputation of Dr. Cox and Dr. Voelcker gave evidence that the moisture content was far too high; in fact, Dr. Cox said that it could not be called cheese at all, and he urged that if the Ministry did not fix standards it was for the Bench, on the evidence, to establish theirs. This is a very dangerous suggestion, because magistrates vary in temperament, education and ideas, and if the fixing of standards were left to their discretion we should have all sorts of mixtures dependent on the views of any particular bench. It is clearly the duty of the Ministry of Food and the Ministry of Health to fix standards which could then be enforced by law. Until such standards are laid down there is nothing against a manufacturer adding more water. It may be immoral, but it is not illegal, and in the case in question the magistrates rightly, in our opinion, dismissed the case on the grounds that there was no fixed standard.

A MODERN JAM FACTORY

Two equally large and important factories in different parts of the country are owned by the Nelson Preserving Co. Ltd., one of which is described in this article. In the short space of twenty years great progress has been made, and the volume of business has increased sevenfold.

T. CROSBIE-WALSH, F.I.C.

A jam boiling pan in action.

THE NELSON Preserving Co., Ltd., is another example of a flourishing and well-conducted food production concern. It was founded in 1919 by Mr. Thomas Porter.

Mr. Porter, who died only in January of last year, was a native of Clitheroe, Lancashire, and embodied in the fullest sense all the true attributes of pure Lancashire stock. Always a hard worker, he decided, on the conclusion of the Great War, to meet as far as possible a vociferous demand for jams at popular prices.

The business was opened in a large factory very close to the centre of a city, "somewhere in England," and was an immediate success—so much so that the need for general expansion and consequently larger premises very soon arose.

Model Factory Erected

In 1922 a large area of land was acquired on the present site—this being an area which the Local Authorities had mapped out as ideal for the erection of model factories. On the land thus acquired, a factory of generous dimensions, embodying all the latest plant and lay-out for the production of jams on an economical and thoroughly hygienic basis, was erected.

Success again immediately attended these efforts, and the constant need for expansion has continued to characterise all the Company's operations, so that the new factory required to be continually extended until, to-day, it is approximately twice the size of the original.

In the period immediately after the opening of the new factory and the outbreak of the present war the volume of business increased sevenfold.

In addition, a model factory was erected in another town where goods similar to those produced in the original factory are turned out on the same economical and hygienic lines and where the expansion of business has been similar to that already experienced.

The goods produced consist principally of jams in great variety, but there are also manufactured very large quantities of marmalade, mincemeat, lemon cheese, table jellies and peels, both of the cut and candied variety.

Cleaning the Jars

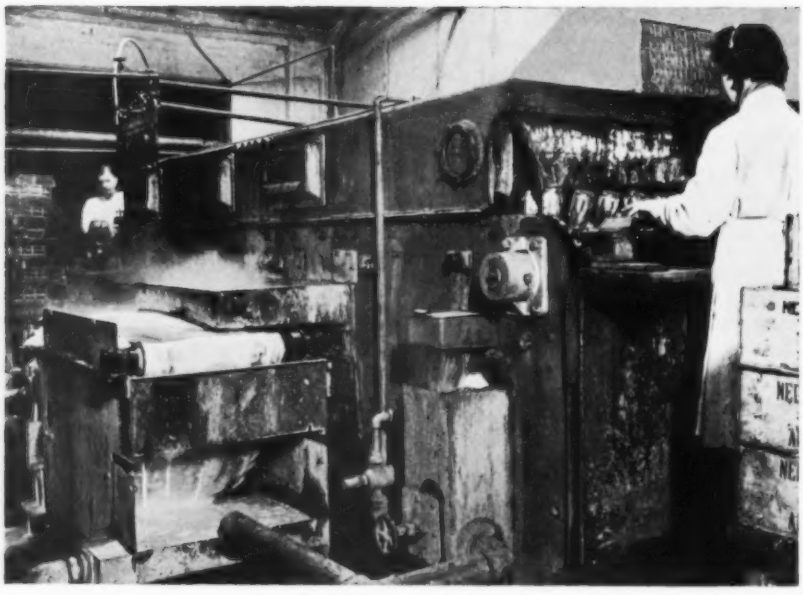
One of the most important items in a jam factory, although perhaps the least picturesque, is the jar washing department. The metamorphosis of many thousands of fusty-looking articles into sparklingly clean, sterile and pre-heated glasses, ready for receiving their complement of hot jam, is the result of much research on the part of the engineer and the chemist. The choice of a suitable and efficient detergent is the first consideration. To put perfectly prepared foods into faultily cleansed containers would be labour lost. The evolution of automatic washing machines which will handle the detergent and rinse the bottles free from it after it has done its work has rendered this preliminary operation not only efficient but economical. In the Nelson factory two operatives work at the two ends of the machine and two machines handle the whole of the huge input of glass jars.

From the washers, the jars pass through the drying machine from which they emerge free from adhering moisture and are warm enough to allow the hot jam to be filled into them without danger of cracking.*

Sugar

The preparation of syrup for the jams and marmalade is conducted in a large independent department. The

* *An article by H. A. H. Crowther, "The Washing of Glass Containers", was published in* FOOD MANUFACTURE, *May, 1939.*



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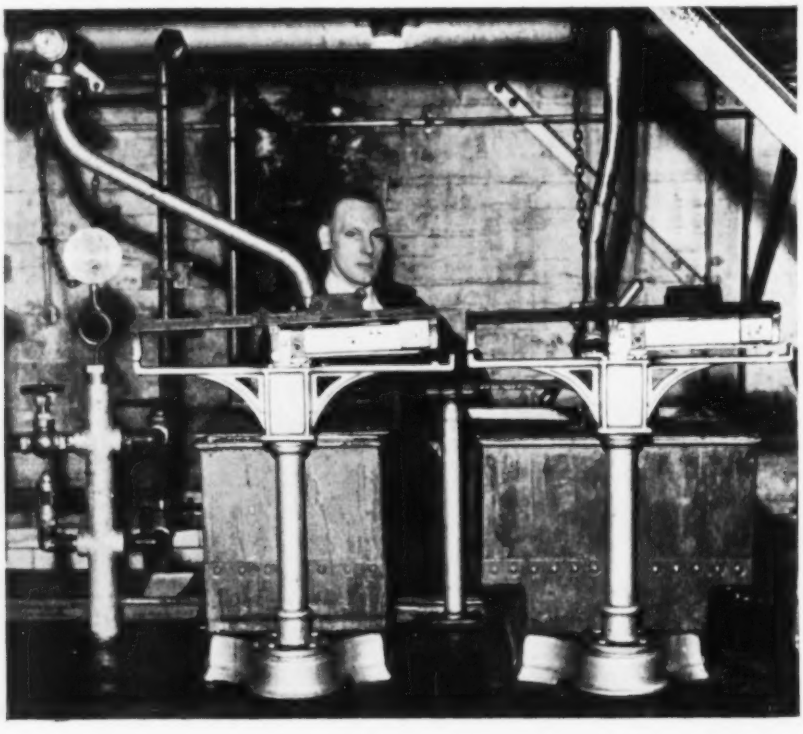
sugar, stored in sacks in the storeroom, is brought into solution in large tanks, heated by steam coils. Filtration through filter-presses ensures that the resultant solution is clear and of almost water-whiteness.

The syrup is pumped from the filter-presses to sealed storage tanks which supply the weighing machines, situated near the boiling pans. As each pan is ready for a fresh load a weighed quantity of syrup is pumped to it, and the required amount of fruit—which has been previously dealt with on accepted lines—is added, after which boiling at a controlled temperature and for the required time is carried out.

Filling of Jars

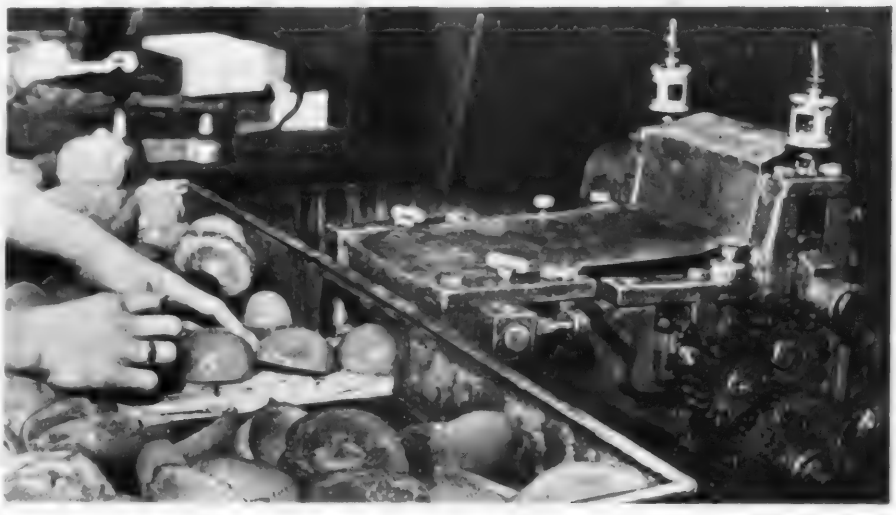
The boiling process having been completed, the jam, after cooling where necessary, conveyed by stainless steel bogies, arrives at the hand-filling tables or filling machines. Certain jams, such as those made from fruit with stones, have not been found by the firm to lend themselves to machine filling and hand filling is resorted to, the jam being conveyed from the bogie to the jars by means of stainless steel jugs.

There is an endless belt running the whole length of the factory, and on this, in wire baskets, run the glass jars from the filling machines or hand-filling tables. This

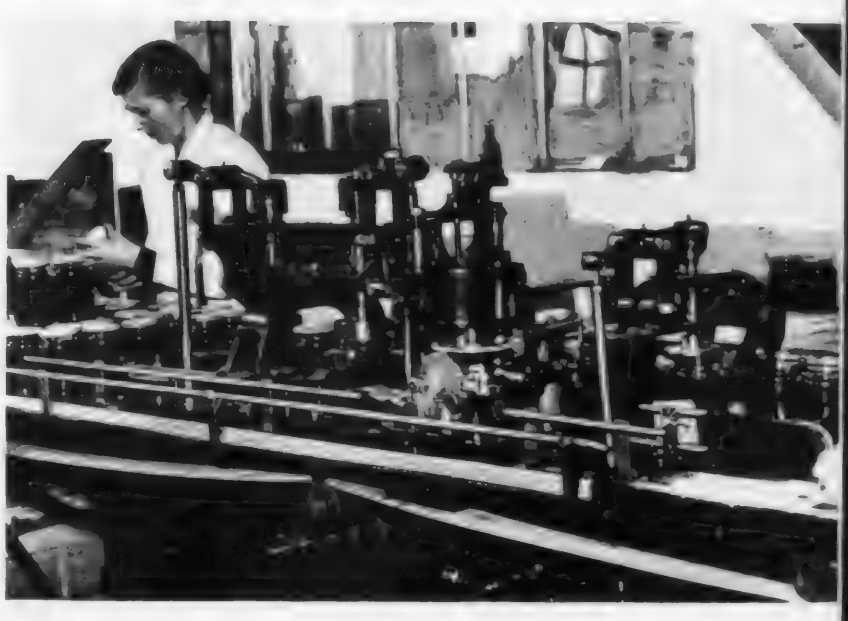


". . . The syrup is pumped from the filter-presses to sealed storage tanks which supply the weighing machines, situated near the boiling pans. As each pan is ready for a fresh load, a weighed quantity of syrup is pumped to it."

"... The boiling process having been completed, the jam, after cooling where necessary, conveyed by stainless steel bogies, arrives at the hand-filling tables. Certain jams, such as those made from fruit with stones, have not been found to lend themselves to machine-filling and hand-filling is resorted to, the jam being conveyed from the bogie to the jars by means of stainless steel jugs." The girl on the left of the picture is placing discs of prepared paper on top of the jam.



"... A large department is devoted to the production of peels of diverse kind—lemon, orange, citron and *spadaforesi* peels in the candied, drained or cut varieties." Cut peel, so largely used by bakers, confectioners and packers of mixed fruit, is prepared by passing the cured and drained peel through this machine.



This illustration shows the capping of jam jars by automatic machine. The jars are fed to the machine by an operative, and the first step is the provision of adhesive to the top rim. When the jar comes under the first plunger a cap is dropped on it. The second plunger presses the cap down and still a third doubles it under the rim. The closed jars go directly to the labelling machine which is situated alongside.

Water-cooled, stainless steel, jelly moulding tables.

is a particularly well-conceived arrangement as it facilitates the lifting off of any particular variety of jam at the point where the stacks representing the stocks of that jam are situated.

The stacked jams are now allowed to cool off to atmospheric temperature and conveyed as occasion demands to either capping tables or capping and labelling machines.

Here, again, both machine and hand work is done, as it has been demonstrated by the Company's experience that, for long runs, machines are found to be economical, while for the assembling of smaller orders finishing by hand is preferred.

Peels

A large department is devoted to the production of peels of diverse kinds—lemon, orange, citron and *spadaforesi* peels in the "candied," "drained" or "cut" varieties. Only by a laborious and somewhat complicated procedure can the best results be obtained, and much depends upon an appropriate and efficient lay-out.

The peels are received at the factory in brine, and the first step in their elaboration is the elimination of the slightest traces of salt—a process, although simple, which occupies considerable time and the use of copious amounts of cold water.

The peels are next introduced into special tubs of unique design, symmetrically lined up and containing syrups of ranging density. The object of this "curing" process is to introduce into the peel the highest practical percentage of sugar, and this is achieved slowly by immersing it into successive syrups of increasing strength.

The curing process is only complete after the lapse of several weeks, and when the peel is ready it is drained free from excess syrup by means of sieves.

The cured peel is used as the material for different finished products. That destined for "candied peel" is selected and placed on trays to dry off in air-heated ovens for about twelve hours. From the drying ovens the peel goes to tables where prepared candy sugar is applied. This candy sugar is produced by rubbing up very hot syrup until a required degree of aeration is obtained. The peel is then placed on trays and a final drying in the ovens effected, after which it is ready for packing and distribution.

That part of the cured peel which is required to be made into "drained caps", or for cutting, receives an extra draining, after their emergence from the tubs. The drained caps are packed direct into the boxes in which they are sold. The third finished product—cut peel, so largely used by bakers, confectioners and packers of mixed fruit—is prepared by passing the cured and drained peel through an appropriate machine.

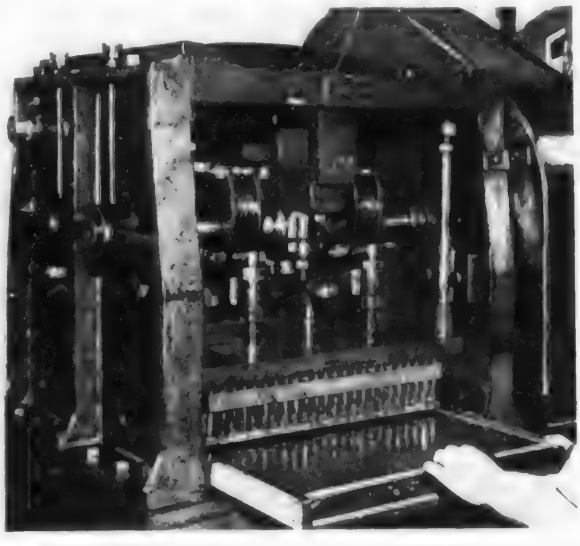
Table Jellies

The manufacture of tablet table jellies is carried out in another very well laid out department. At one end of it is a row of the latest type of quick-boiling pans in which the ingredients, consisting of gelatine, sugar, glucose and flavouring essences, are boiled and mixed.

From the pans, the liquid jelly is transferred to the water-cooled, stainless steel tables, by means of stainless steel bogies. These tables make quite an impressive sight, occupying as they do the whole of the centre of the very large well-lighted room. Their total area is very extensive and their capacity reaches several hundred gross of table jellies daily. The tables are divided into sections approximately 20 inches square, which enables slabs of convenient size to be handled in the subsequent operation—the cutting into the familiar "squares".

The cooling operation is a rapid one, and when solid, the slabs are cut in a machine which not only cuts them into pint jelly tablets but intercubes them, to facilitate the easiest possible separation when they are being made up for the table by the consumer.

Wrapping and cartoning is carried out either by automatic machine or by hand, according to the nature of the final article. Those tablets which are ultimately



The slabs are cut in a machine which cuts them into pint jelly tablets.

Crystal table jelly filling machine.

sold in cartons are dealt with in a machine which performs both operations, the jelly tablet being fed into one end of the machine and coming out at the other end wrapped and cartoned ready for delivery.

The hand-wrapped tablets are those which are sold in a cellophane wrapper only. This form of pack, used in conjunction with an attractive seal denoting the brand and flavour, is becoming increasingly popular, and the Nelson Company have made a big feature of it.

An adjunct to the jelly making department consists of the packing of crystal table jellies. The crystals, composed of high-grade gelatine, sugar and flavouring, are filled into bags by an automatic machine.

Lemon Cheese and Mincemeat

The ingredients of lemon cheese are treated and sieved. The variety of the ingredients necessitates due attention to the obtainment of a homogeneous mixture, and special pans with automatic stirrers are used. Mincemeat also forms a considerable part of the firm's output. Its production is provided for in a separate building in which power mixers deal with the ingredients rapidly and in large bulk. Filling into jars is effected by specially designed machines.

The Boiler House

Steam is raised by the most up-to-date equipment in the form of two large Lancashire type boilers, fitted with automatic stokers and economiser. Provision is also made for the use of oil fuel if necessary. The water used is drawn from the Company's own well and is previously softened.

Welfare Department

The Nelson Company does not fall short in modern "welfare" methods for their employees. A separate building, entirely removed from factory noises and atmosphere, houses the fine dining hall and welfare centre, where there is more than ample room for all the workers employed.

The A.R.P. organisation is complete in every respect and fully up to the required standard. Air raid shelters of the ferro-concrete type are capable of providing for all workers with a 10 per cent reserve.

Over the whole range of their activities, the Nelson Preserving Co., Ltd., may be congratulated on conducting an excellent example of a modern factory admirably adapted, fitted and organised to produce the goods for which it was erected.

SOME SUPPLIERS TO NELSON PRESERVING CO., LTD.

Jar-Washing Machines: *Robert Kellie and Son, Ltd.; R. Powley and Sons, Ltd.*
Capping Machine: *Rose Bros. (Gainsborough), Ltd.*
Labelling Machine: *Purdy Patent Machinery Co., Ltd.*
Glucose: *Corn Products Co., Ltd.*
Automatic Stokers: *Bennis Combustion Co., Ltd.*
Economiser: *E. Green and Son, Ltd.*
Boiling Pans: *Wm. Brierley, Collier and Hartley, Ltd.; H. Braithwaite and Co., Ltd.*
Motors: *Crompton Parkinson, Ltd.*
Conveyors: *Rownson, Drew and Clydesdale, Ltd.*
Filling Machine: *Robert Kellie and Son, Ltd.*
Filling Machine for Crystal Jellies: *Southall and Smith, Ltd.*
Jelly-Cutting Machine and Tables: *Wm. Brierley, Collier and Hartley, Ltd.*
Water Softener: *Neckar Water Softener Co., Ltd.*

Estimation of Sulphur Dioxide in Fruit Juices

A NEW reagent for sulphur dioxide determination developed by I. V. Sverchkov is prepared by mixing together in a mortar 1 part of a 1 per cent. aqueous solution of methylene blue and 2 parts of a 5 per cent. solution of iodine in potassium iodide. After 24 hours the precipitate is filtered, mixed with distilled water and centrifuged. It is then acidified with sulphuric acid and preserved under water. It is utilised in the following manner:

5 c.c. of the juice under test and 2 c.c. of $N/_1$ alkali are introduced into a test tube and left for 15 minutes. The liquid is then faintly acidified with sulphuric acid and one to two c.c. distilled off. The condenser is a glass tube 15 to 20 cm. long passing through the cork of the test tube. A few flakes of the above reagent are then added to the distillate when a blue colour indicates the presence of the SO_3 ion. The test can be made quantitative with the aid of a series of standard tints.—*L'Actualité Chimique.*

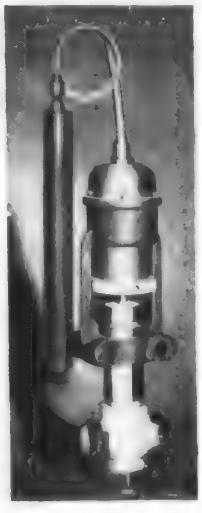
JAM AND FRUIT PRODUCTS

PLANT AND EQUIPMENT

AUTOMATIC CONTROL

Thermostatic Valve

Where process plant is heated by steam or hot water, automatic temperature control can be conveniently and simply achieved by regulating the flow of the heating medium. The thermostatic valve illustrated here is designed for this particular purpose, and is a typical example of a number of models produced by The British Thermostat Co., Ltd.



The unit is, in effect, a conventional valve which is automatically operated by change of temperature, the valve opening or closing progressively and varying the flow in such a way that the temperature of the controlled vessel is maintained constant, provided the steam temperature and pressure do not vary.

The valve is operated by a seamless metallic bellows which is connected by a capillary tube to a bulb or phial charged with a volatile liquid. The phial is located in a position where it is exposed to the temperature to be controlled. Increase of temperature at the phial results in a corresponding increase of vapour pressure in the charged system and decrease of temperature results in a decrease of vapour pressure. This change of pressure causes the bellows to expand or contract and to operate the valve progressively.

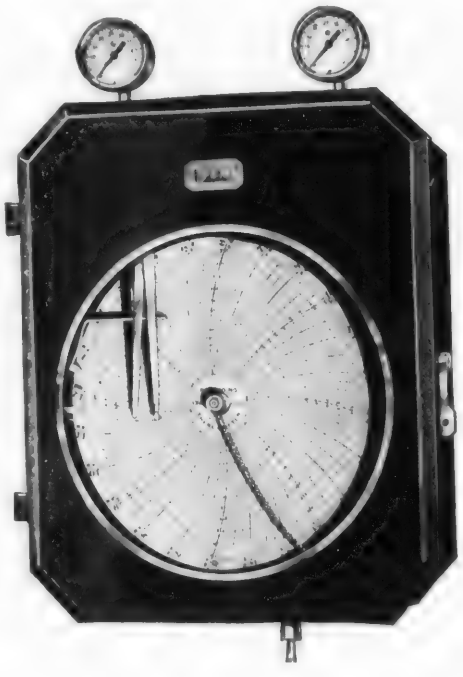
Movement of the bellows is opposed by a spring, the load of which can be adjusted in order to pre-set the temperature to be maintained.

Control of Jam Kettles

The automatic control of jam kettles has always been an outstanding problem. Short and Mason have evolved a scheme which should find universal application. It is no longer necessary to depend solely upon the human element when cooking jams, jellies, marmalades or preserves. A temperature controller is used for this purpose. It is operated by compressed air and works in conjunction with diaphragm steam valves and other devices. The method is as follows:

The stainless steel controller sensitive member is supported inside kettle and transmits changes in temperature of the jam to the controller mechanism, automatically recording this at the same time. As the water in the fruit juices boils away and the concentration increases, the temperature rises. In fact, this rise in temperature is practically continuous up to the point where the desired concentration is reached.

Before starting to cook, the temperature controller is set to shut off steam at the required point. Immediately the contents of the kettle reach set point the controller causes the steam to shut off automatically, and at the same time exhausts steam remaining in jacket.



The only manual operation necessary consists of adjusting control point. The recording chart unerringly tells when during the cook the different ingredients were added. This feature checks the amount of materials used for comparison with the amount allotted for the day's production.

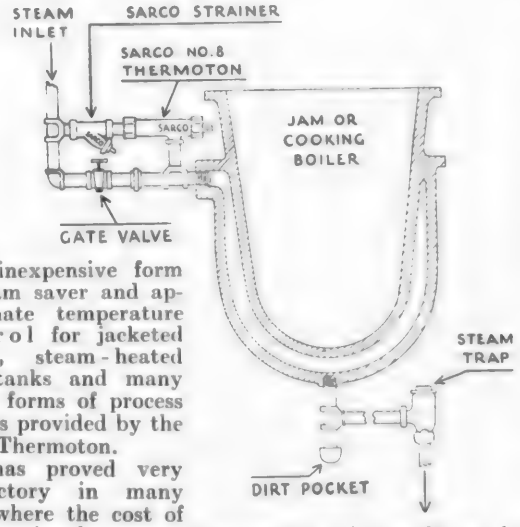
The Fulscope Controller is fitted with adjustable sensitivity device so that the instrument speed of response can be adjusted to the time lag of the apparatus, thus giving an immediate and accurate response to changes in temperatures.

Industrial mercury-in-glass thermometers are an invaluable aid as a check on all types of processes, and it should be borne in mind always to obtain thermometers with the shortest possible temperature range to cover requirements such as 200°/220° F. for jam cook-

ing. Stainless steel stems and fittings are now standard on most good-class thermometers, and the newly developed "Binoc" patent lens magnifying tube is claimed to be three times easier to read than the normal pattern.

A specially designed barometer is definitely recommended as an asset to jam boiling. It is fitted with an auxiliary temperature scale which gives the correction necessary for change in boiling point due to changes in barometric pressure. The pointer immediately gives the number of degrees to add or subtract according to the barometer reading.

Sarco Thermoton



An inexpensive form of steam saver and approximate temperature control for jacketed pans, steam-heated water-tanks and many simple forms of process plant is provided by the Sarco Thermoton.

It has proved very satisfactory in many cases where the cost of a conventional type of thermostatic valve could not be justified. In the case of small equipment heated by coil or jacket, and particularly in processes requiring a "simmering" operation after initial boiling up, the Thermoton Type 8 is installed in the steam inlet pipe as shown alongside. The apparatus is brought up to temperature through the by-pass, which is then closed by hand and the Thermoton automatically adds enough steam to maintain the temperature desired.

As can be seen from the illustration, the Thermoton is a simple pipe-line fitting. The steam valve is in the inlet end of the body, which also houses the thermostatic element. This latter is of the standard Sarco cylinder and piston type filled with oil and hermetically sealed by Sarco spiral bellows tubing, which at the same time forms a frictionless leak-proof gland for the valve-closing plunger. This unique construction entirely eliminates ordinary gland packing, allowing at the same time absolutely frictionless movement of the plunger. The oil expands under the influence of the temperature surrounding the element imparting movement to the piston, the plunger of which carries a valve head which closes down on to the inlet valve seat. A simple means of temperature adjustment, and a relief spring to protect the element against accidental overheating are also provided in the head of the Thermoton.

In the application illustrated the element reacts to the temperature or corresponding pressure in the jacket of the pan, thus indirectly controlling the temperature of the contents. Where a direct control is necessary one of the other types of Sarco Regulator, in which the thermostatic element and valve are separate units connected by capillary tube, should be used. Advice as to the correct type of control to use for any particular plant or process will gladly be given by the makers—Sarco Thermostats, Ltd.

MEASURING STEAM AND WATER

For fruit preserving and jam factories flow meters are used for measuring water and steam. Water meters may be used for boiler feed in the power plant or for bore-hole discharge if the factory possesses its own water supply.

Steam meters are important for checking the amount of this valuable commodity that is being taken by various machines, boiling pans or vats, or for driving engines. Boiler output is often measured in the boiler house by means of a recording meter and the steam used by departments and machines checked up by means of an integrating meter.

The Kent K.M. Recorder, made by George Kent, Ltd., is widely used in all industries for water, steam, air, oil or gas. It is of sturdy construction and is built on the differential pressure system—that is to say, an orifice fitting is inserted between flanges in the main and connections are made from the upstream and downstream sides of this orifice to the two legs of a mercury-filled U-tube in the recorder. The rise and fall of the mercury corresponds closely with the variations in flow, and through suitable mechanism a float actuates the pen on the chart. Absolute reliability is assured and accuracy is well maintained over long periods of service.

This type of meter may be mounted individually on a wall or in groups on an instrument panel. The recorder may also be transmitted by Telerecorder to any distance from the point of measurement.

The Kent RS/C Shunt Steam Meter, made in sizes for 2 in., 3 in. and 4 in. pipes, is the most economical instrument for measuring steam in small mains and for costing and keeping a check on departmental supplies.

It is bolted directly into the main between flanges and the quantity is read off on a counter dial. The mechanism is simple and robust. The meter is not damaged by overload and will register fluctuating flows accurately.

SUGAR TREATMENT PLANT

The main object of this plant is to enable the jam manufacturer to use a cheaper grade of sugar, and by dissolving this in water, then filtering and decolourising same, to supply the sugar syrup to the jam boiling pans without any handling whatever. Every operation is done by the manipulation of valves, and the passage of the sugar syrup from one operation to the next is accomplished by means of pumps, gravity or compressed air.

The syrup for each boiling of jam is weighed and the correct amount of invert sugar is included. The weighing of the sugar syrup and invert sugar is done by a girl, who then blows the charge of mixed syrup into the jam pan. The whole operation of using the plant is very simple and can be easily understood by unskilled labour.

Its operation, as described by the manufacturers, William Brierley, Collier and Hartley, Ltd., is as follows:

The necessary amount of water is run into the preheating and calibrating tank. Here it can be heated to any temperature. From the tank the water flows by gravity into the sugar dissolving pan, when the sugar is dumped in, and dissolved by the motor-driven stirrers. After dissolving the "Filter-cel" and "Activated Carbon" are added, the whole being thoroughly mixed up. The syrup is then pumped into the receiving drum, from whence it is blown by compressed air through the filter press.

The resultant sugar syrup is a clear liquid nearly water-white, and can be used immediately in the jam pans.

CONCENTRATING AND CLARIFYING FRUIT JUICES

Concentration Unit

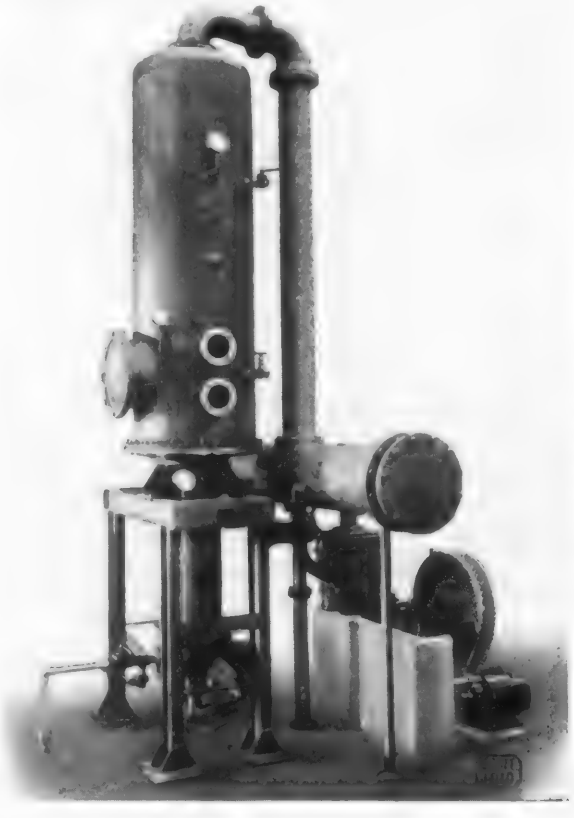
In the handling of fruit juices it is essential that low temperatures should be employed to avoid damage by overheating. The metals of construction should be such that there is no possibility of contamination of the product or corrosion of the plant.

The illustration shows a standard unit of the type made by George Scott and Son (London), Ltd., and employed for the concentration of fruit juices in medium up to large quantities. All contact parts are in a special quality of stainless steel found by experience to be satisfactory for fruit juices.

High concentrations are necessary with some juices, and to eliminate risk of stagnation in the liquor, particularly in the final stages of concentration, it is essential to keep the liquor in movement. The Scott patent forced circulation system is employed for this purpose. This considerably reduces the size of heating surface and enables small finishing batches to be obtained without any risk of bare spots on the heating surface with local overheating. Standard concentration units are supplied with or without surface condenser.

Where ester recovery is called for this is carried out in a similar plant but with a surface condenser of the vertical type together with receivers. Esters can be removed at any required temperature according to the juice to be handled and the fraction is retained in the receivers. Concentration is thereafter carried out at a lower temperature by the use of special vacuum equipment, this ensuring that the liquor is not subjected to high temperatures longer than absolutely essential.

A small unit of a similar type is fitted with a jacketed vessel and stirring gear.



The plants are built with a view to giving complete accessibility for cleaning and thorough sterilising and are dull polished internally. Plants of this description are most satisfactorily worked on a batch principle, particularly if ester recovery is required owing to the extreme sensitivity of continuous working units. Where ester recovery is not called for, plants are usually arranged for continuous input until the batch of finished liquor is made up.

A Super-Centrifuge

As scientific production methods succeed the rule of thumb in the food industry, there grows a demand for process equipment capable of a high degree of control, together with speed and continuity of operation. One process frequently encountered in the food industry is separation or clarification, and it is a process that grows more common as the quality of food products improves. For this process the centrifuge is taking the leading place, for it alone combines speed and complete control with a high degree of separation.

Of the different types of centrifuges the Sharples Super-Centrifuge employs a small diameter bowl revolving at high revolutions per minute, which results in many notable advantages. Sharples Centrifuges, Ltd., claim that it produces 2¼ times the centrifugal force of any other commercial machine with an actual reduction in stress and wear. This results in either a greater degree of clarification or a higher rate of flow for a given size of machine, as required.

An important advantage of this type of bowl is its simplicity, for it needs no discs. It consists of only three parts, and these can be dismantled, cleaned and assembled in 10 minutes by one man. Thus interruptions in the continuity of production are reduced to a minimum.

Where it is necessary to avoid contamination of the product, the super-centrifuge is available with Monel bowls. Such bowls are generally used for the separation and clarification of alcoholic extracts, pectin solutions, vegetable and fruit juices, soups, sugar syrups and cider.

FILTERS FOR CORDIALS AND SYRUPS

The Metafilter places at the disposal of the food manufacturing industry a unique means of obtaining brilliant and sterile filtrates. It entirely replaces flimsy and troublesome filter bags or cloths. These latter require constant sterilisation or replacement, whereas the Metafiltration system makes use of an entirely sterile filtering medium which is replaced for each filtration, and is in consequence new, pure, and fresh for every batch of liquid filtered.

The packs of scalloped rings in the construction of the filter are extremely robust and quite indestructible. They are made in various metals to suit the characteristics of various liquids. The filtering media used are similarly adapted to the filtration result desired. It is possible to use media which give complete clarification or special media which completely sterilise the liquid being filtered.

Another advantage, where batches of liquids having different flavours have to be filtered, is that the materials used in the construction of the filter and for the filter bed, cannot absorb any flavour, so that one batch cannot be affected by the flavour of a previously filtered batch.

Rapidity of operation is another point of importance; a filter bed can be removed and a new one deposited in less than 15 minutes. This is a very different operation from that of dressing a filter press.

A final advantage which will be of interest to users of filter bags is that the Metafilter can be used up to pressure of 100 lb. per square inch. It can produce brilliant sterile filtrates from viscous or non-viscous liquids, gums, gelatins, acids or alkalies.

The filters find an application in almost every industry among which are the food, mineral water and pharmaceutical worlds.

ACID PROOF FLOORING

The illustration shows an acid proof floor recently laid at a famous sauce and pickle factory in the north of England, which was particularly required to resist the action of various acids, sugar, etc. The acid proof Cement Prodor used by Prodorite, Ltd., is claimed by the manufacturers to be the best acid proof cement obtainable, being equal in every respect to the famous German Hoeschst Cement.

Prodorite, Ltd., specialise in industrial flooring of every description. They have made a special feature of acid proof flooring for food factories, which they have laid for some of the largest food manufacturing firms in the country and which have given great satisfaction.

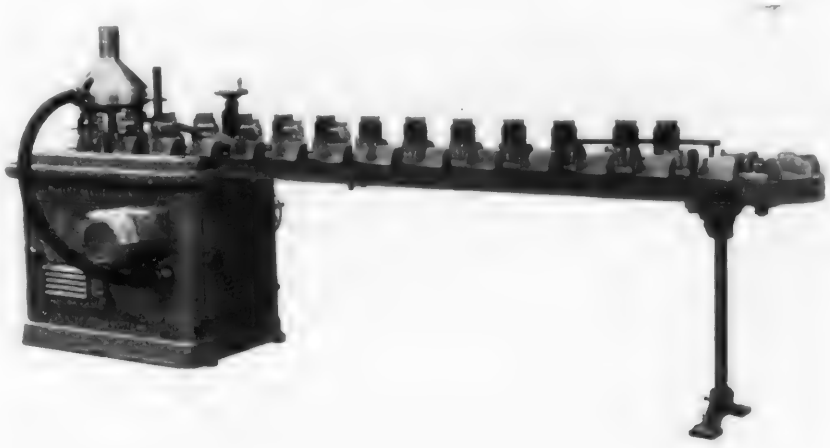
They also specialise in special cement surfaces for practically every type of industrial floor—non-dusting, non-slip, hard wearing, oil proof. A wonderful range of tiles, suitable for many purposes, is also included in

their specialities, amongst which is a range of special presser tiles for hard-wearing service, including steel-faced tiles, and to give a really artistic effect they offer art tiles for floors and walls. The latter are obtainable in a complete range of plain and various combinations of colour, being eminently suitable for canteens, entrance halls, passages, bathrooms, etc.

JAM FILLING

The extended model of the motor-driven two-speed plunger jam filling machine illustrated, although specially designed for jams and jellies, will also handle any product, such as mayonnaise or sauces, capable of being pumped. This model has 31 jar carriers for 2-lb. jars, each of which is provided with removable adapter for 1-lb. jars. The standard machine is usually provided with 19 jar carriers. The extended model permits the tissuing operation being carried out at the delivery side of the machine without removing the filled jars, eliminating the need for a separate delivery conveyor.

The all-bronze pump is of the reciprocating double plunger type provided with two speeds and works in combination with a rotating bronze cut-off valve. The pump draws its supply of jam, etc., from the receiving tank, which, preferably, should be as close to the machine as possible, measures the required amount, and pumps it direct to the rotary bronze filling nozzles. It gives a smooth and continuous flow.



All mechanism is entirely enclosed, suitable doors being provided in the framework to afford convenient access to the motor and gearing, or for cleaning and lubricating purposes.

Owing to the simplicity of the pump and the use of a micrometer scale on the feed regulator, the setting of the machine for different sizes of containers can rapidly be accomplished. It is claimed that the change over from 2-lb. jars of jam to 1-lb. jars of marmalade can be effected in 15 minutes. The machine has been designed and constructed by Robert Kellie and Son, Ltd.

FILLING AND SEALING POWDERS

With the improved bag and envelope feeding, filling and sealing plant for jelly powders, etc., bags are automatically fed from the magazine, filled, and afterwards are discharged to the sealing position of the machine, passing the necessary gumming attachments. When the sealing has to be more than normally secure, additional processes are incorporated for this purpose.

The finished pack is either discharged at the end of the machine, stacked or counted according to requirements. Speeds of 70 per minute are obtained with a single filling unit and 120 per minute on twin unit. Adaptations are made to suit special requirements.

The machine is very compact and is complete with "built-in" motor for driving, thus installation is readily and easily carried out in a few hours. The space taken up by the machine is negligible.

The Automatic Weighing and Packing Machine Co. claim that simplicity of design assures efficient working and the machine will run for a long period without attention apart from feeding the hopper with powder, the magazine with bags and taking away finished packages.

SUBSTITUTE MATERIALS

For Sugar

During the last war "Sugarol", a liquid sweetener, proved a great help to many mineral water manufacturers and ice cream manufacturers, and it is still very popular with that class of manufacturer, for, being in liquid form, it is easy to use and very economical, 1 oz. taking the place of 12 or 14 lb. of sugar and the bulk being easily made up with water or milk. Now it is in demand by other trades, and though the absence of bulk may be a disadvantage to some, its cheapness makes it possible for other ingredients to be added without increasing cost, whilst its perfect sweetness gives that "want more" flavour which increases sales. Biscuit manufacturers and pastry manufacturers and even jam manufacturers are finding it necessary to improvise, and the maker, Mr. Arthur Whittaker, feels they would do well to give Sugarol a trial.

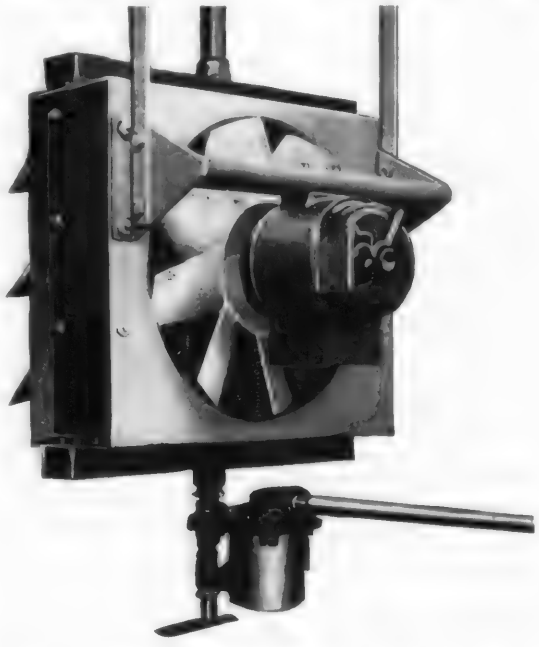
For Glycerine

Claimed by the manufacturers to be a perfect substitute for glycerine in foodstuffs and a partial substitute for the normal sugar content of confectionery, Sucromel is a honey-like sugar, guaranteed all British. Points to be noted about it are that it enhances and retains the soft sponginess of sponge goods, prevents graining and drying by loss of moisture in marshmallow, retains the moisture and freshness of bread and prevents sandiness and rough crystallising of icings. Sucromel does not ferment or mould, and indeed it appreciably retards mould, and 10 per cent. of it will be found to prevent fermentation in chocolate centres. It is claimed to be standardised and absolutely neutral—*i.e.*, neither acid nor alkaline—and equal in sweetness to ordinary sugar.

The manufacturers, Cumming, Parsons, Ltd., state that the addition of Sucromel in the less acid jams will prevent crystallisation of the sugar and help to retain the natural colour of the fruit.

DRYING

A Spiral Tube Drying Unit installation has recently been installed in South Africa for drying oranges after washing, instead of the usual sun-drying, and is proving very successful. Time is saved in the process and the drying can be exactly controlled. Large numbers of these units are in use for tea withering, and also for such diverse processes as the manufacture of milk



powder, drying biscuit tins, drying milk churns, etc. They are used in conjunction with drying ovens or conveyor drying machines. New uses are constantly being found for these machines in various trades where a large supply of warm, dry air is required to absorb moisture.

The units heat the air by means of either hot water or steam, which passes through the inside of the tubes in a similar way to a motor-car radiator. The electric fan drives air across the finned tubes and picks up the heat into the air stream. A special model is also manufactured which is entirely operated by steam. The fan is operated by steam, which then passes through the tubes, and its heat is given off through the gills to the air stream. This model is particularly suitable for use in explosive atmospheres as, of course, no electrical wiring is necessary. Made by Spiral Tube and Components, Ltd.

ECONOMISERS

The vertical tube economiser consists of a series of sections or rows of cast-iron tubes 4⅞ in. in diameter and 9 ft. to 13 ft. long, placed in an enlarged part of the main flue, the tubes being fitted on their external surface with slow-moving scrapers. The sections are from four to ten tubes in width, and are arranged in suitable size, length and width for any required set of working conditions.

The saving in fuel varies widely from, say, 10 per cent.

to 20 per cent., according to the working conditions and size of economiser installed.

The capital cost of an economiser can be recovered from savings in from one to five years, all depending upon cost of coal, size of economiser, load factor, etc.

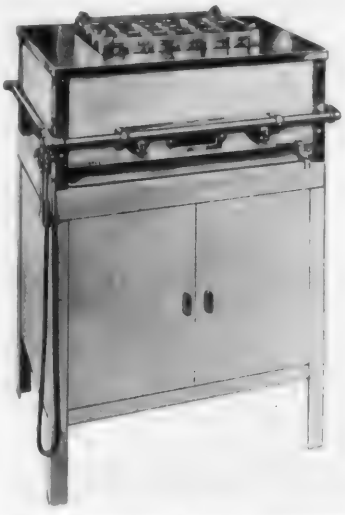
Increased boiler pressures made necessary certain alterations in the design of the standard economiser, which, although suitable in every way for normal pressures, does not provide for the higher pressures now met with. The chief alterations are: The staying of a certain number of socket joints in each section; a reduction in the diameter of the internal lids; circular type of top header, in place of the flat-topped rectangular design. This economiser, known as the Vertical Tube "Ringstay" Economiser (for high boiler pressures), is marketed by E. Green and Son, Ltd.

Modern developments in boiler practice brought in their train not only plain-tube economisers with horizontal tubes, but also economisers having extended surfaces, such as the cast-iron gilled-tube economiser, with various shapes and depths of gill.

One of the main features of latter-day practice is the increase of the gas velocity through the economiser, and economisers with horizontal tubes lend themselves very well to the adoption of these high gas velocities.

Other types of economisers are the gilled type, the "Premier Diamond", which can be applied to all types and sizes of boilers, and is suitable for pressures up to 4,000 lb. per square inch.

MILK WARMER



The Multiserve Milk Warmer for heating bottles of milk to drinking temperature.

The Multiserve Milk Warmer, made by Radiation, Ltd., has been designed to provide an efficient means whereby milk may be heated to the correct temperature for drinking. This operation can be carried out easily and quickly with the minimum of trouble and labour. Relays of baskets containing milk bottles can be heated, and then stored in the warming chamber below, ready for distribution when required. An appliance of this kind may be of interest to factory managers and those people responsible for the welfare of large staffs.

Another item is the St. Stephen Gas Radiator. Radiation, Ltd., have just completed an installation of fourteen of these in a London factory. This heater is especially designed to give maximum heating efficiency, yet in appearance to have the dignity and neatness to make it commendable for installation in large buildings, workrooms, factories, etc.

PUMPS

Special pumps, all-British and of high efficiency for food and chemical industries and processes, are claimed by the makers, Pulsometer Engineering Co., Ltd., to be able to compete advantageously with any pump on the world market.

(1) Stoneware Pumps in which interior parts are made of acid-proof corundum, which is unaffected by temperature changes and does not contaminate or discolour liquids.

(2) Pumps made in Austenitic steel or other corrosion-resisting metal adapted to the particular liquid to be pumped. The weight of the metal is reduced to a minimum and the shaft is entirely supported outside the pump casing.

(3) "Resiline" rubber-lined pump.

EVAPORATORS

The concentration of solutions is one of the requirements of numerous industries, and the type of plant to suit the varied conditions which exist calls for the special attention of chemists and engineers.

Most solutions vary in their chemical and physical characteristics. Certain liquids on concentration solidify on cooling, others deposit salts during concentration, others have a high viscosity or boiling point; and each case necessitates careful consideration to determine the most efficient and economical type of plant for the purpose required. This may range from a simple open top pan heated by steam or other means, to a sextuple multiple effect with auxiliaries operating under vacuum; or it may be found necessary to effect the desired concentration in a plant comprising two units of differing types.

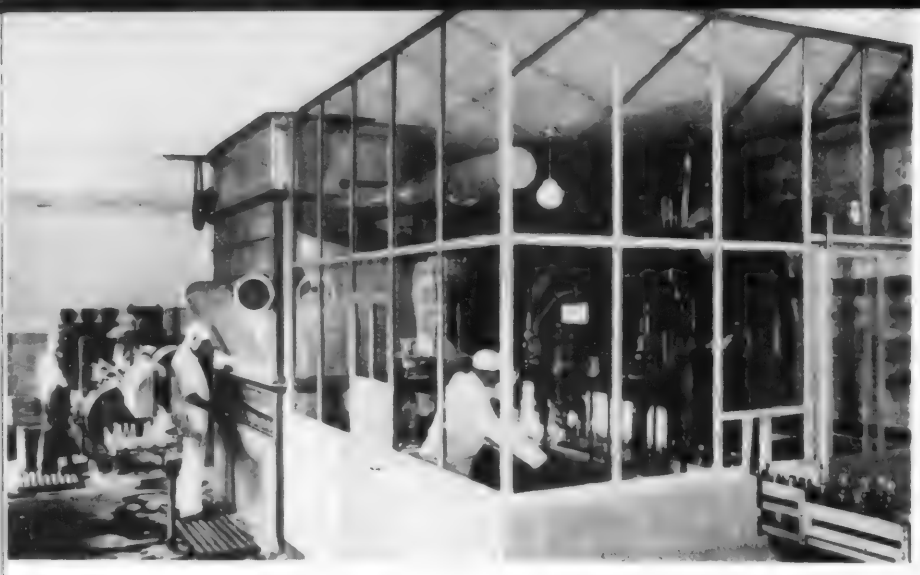
S. Briggs and Co., Ltd., have designed and manufactured many types of evaporating plant, but whenever possible they like to co-operate with their clients' technical experts in the selection and design of the best type of plant for the specific purpose required.

APPLE PECTIN

In the production of jam it is essential that the maker should be able to obtain a satisfactory set, and, as will be known to the practical man, not only will different types of fruit vary in their setting properties, but also different samples of the same type of fruit, and therefore it is, above all things, necessary that implicit reliance can be placed in the pectin used. This is more than ever necessary to-day, in view of the sugar difficulties, when a batch of spoiled jam is indeed a serious matter.

"Elpex" Apple Pectin has been used throughout the jam industry in this country for over 20 years, and William Evans and Co. (Hereford and Devon), Ltd., claim that its success is in a large measure due to its unvarying standard of setting value. Every batch is tested by means of actual sugar gels prior to despatch, and the strength of each gel is tested with a special apparatus.

It can truthfully be said that while inexperienced makers may be able to produce some satisfactory pectin, it is not an easy task always to produce pectin to a standard strength.



An installation of a Cold Process Bottling Room.

LIQUID APPLE PRODUCTS

THEIR SIGNIFICANCE FOR THE FOOD INDUSTRY

(PART 1)

In this striking article

VERNON L. S. CHARLEY, B.Sc.,

Department of Agriculture and Horticulture,
University of Bristol Research Station,
Long Ashton,

not only discusses apple juice from many angles but also communicates hitherto unpublished results of the latest researches carried out at Long Ashton.

DURING the past six years this journal has included on several occasions articles dealing with the research activities of the above Research Station along the line of liquid fruit products, together with details of such commercial developments as had taken place at those times. The chief subjects have been pure apple juice and soft fruit juice syrups. The latter project has been beset with obstacles, but during the last two years the products have definitely "arrived" and satisfactory sales are now being obtained and new uses are gradually being discovered.

The Apple Juice Story

The apple juice story, however, is of a different nature. The research work at Long Ashton was done at the behest of the Ministry of Agriculture, who, in turn, were pressed by the fruit growers to undertake the work in order to discover some profitable use for surplus and glut crops of apples. The members of the fruit-growing industry have, with few and isolated exceptions, adopted from the first the attitude that the writer should attempt to interest existing commercial food and beverage firms in the possibilities of utilising the surplus apples either in their own or new types of products, and so remove the onus for the actual processing from the fruit growers themselves. While there are obvious disadvantages connected with the industry developing its own products factories, the reverse attitude—taken by some outside concerns—that the utilisation of the growers' surpluses must remain their own funeral, has something more than a modicum of sense. At any rate, outside interests have been loath to collaborate, except in terms for the purchase of the fruit which obviously regarded the apples as an absolutely waste product. One manufacturer even remarked, "They ought to pay me to take the fruit away!" The surplus apple crop is not so valuable that it can be regarded as a veritable widow's cruse, providing profits for all and sundry, and the writer can still see no reason to modify his previous view that the fruit-growing industry must provide both the initiative and a certain financial interest in any development designed to remove low-grade fruit from the market.

Variation of Crop

One of the most serious drawbacks to a more immediate commercial exploitation of the known processes is the wide variation in crop from year to year which leads to an even greater variation in the amounts of fruit which become surplus. No figures whatever are known regarding actual tonnages which become surplus or are literally wasted. The weights for total crops and surpluses are uncertain. The Ministry of Agriculture issues every five years a request for a voluntary filling in of simple forms to give an estimate of these quantities and areas. In 1936, 70,696 occupiers of farm holdings, shown by the statutory (and compulsory) June 4 census to be growers of fruit, were circularised, but as only 40 per cent. of this total replied, it must be presumed that the remainder regarded the invitation with as much favour as their contemporaries in Russia would welcome

an invitation to an Ogpu tea party. However, "in the absence of evidence to the contrary, the Minister assumed that the sample was representative", and the totals were calculated accordingly.

The following table (*J. Min. Agric.*, April, 1938) consequently has a certain interest.

Number of Apple Trees in England and Wales

	Dessert and Cooking.	*Cider.*
1921	12,102,000	2,727,000
1931	12,456,000	2,373,000
1936	13,325,000	2,795,000

Production of Apples in England and Wales (in Tons)

	Dessert and Cooking.	*Cider.*
1925	326,000	58,000
1931	78,700	37,400
1936	315,000	95,800

There is little doubt but that since 1936 there has been a further significant increase in acreage, and it was estimated that the crop last autumn amounted to over 500,000 tons. In October, 1939, there was reason to expect that between 70,000-100,000 tons of apples would be unable to be consumed or processed, but by the valiant efforts of the canning industry, which broke all records with solid and other packs of apples, this figure was probably reduced to the 25,000-30,000 ton mark. While there is no way of obtaining a definite check on this figure, there can be little doubt that an enormous quantity of fruit was allowed to rot, and much sound fruit, which was not accommodated in satisfactory stores, was finally knocked *hors de combat* by the frosts of January, 1940.

Heavy Gluts

A rough estimate suggests that 10-15 per cent. of total crop harvested under normal conditions will not be suitable for sale through the usual fresh fruit market channels, and this percentage is naturally greatly increased in years of heavy gluts. But the chief problem is how to build up a stabilised products industry in circumstances of such variable annual amounts of raw materials. There seems to be no doubt, however, that there is a regular surplus of apples much greater than is being utilised by the existing demands of the jam, preserving and apple juice industries.

Certain seasons exhibit excessive problems, and 1939 provided one of the worst gluts in living memory. The writer was asked by the B.B.C. in October last to broadcast on some phase of his work, and chose the recent investigations on apple treacle and jelly, which will be referred to in some detail in the second part of this article. One of the results was an overwhelming spate of correspondence (in which the fruit growers were prominent) imploring help in using up their harvest. In one county alone it was obvious that many thousands of tons of apples had already rotted, while letters from all over England and Northern Ireland showed the need for some concerted action to save the waste. In this connection it is appropriate to recall the Prime Minister's pledge to the agricultural industry last month in which he promised that every crop that was grown would definitely be harvested. It is unlikely that there will be a large surplus of apples this autumn—the golden opportunity of putting theory into practice has been lost—but whether any machinery will be officially forthcoming to avoid any waste that may possibly arise is not yet clear.

THE APPLE JUICE POSITION

When enthusiasts for apple juice (the *pure* beverage is understood throughout this discussion) pointed to the amazing developments of the unfermented juice industry in Germany, Jeremiahs in plenty were found who explained the whole affair by a reference to Nazi methods and the peculiar closed economic system existing in Germany. Such doleful pessimists would not agree that the German public were prepared to pay a high price for a healthful beverage of a guaranteed quality. No answer could be found, however, to the equally amazing success of apple juice in Switzerland, a country flowing with wine and plenteously endowed with superb breweries equal to any European country. As selling costs are an important factor in the economics of any marketable commodity, it may be useful to consider domestic views on this matter.

Two schools of thought concerning the selling price of the product exist in this country. On the one hand, many feel that it is essential to reduce the retail price to 4d. per ½ pint container (can or bottle), with an appropriate reduction on larger sizes, and that the price must first be fixed, and the product then produced to fit the selling cost. But some take the diametrically opposed view, by insisting that the high quality of the beverage is the first consideration, and that the price should show a just relationship with the quality of the product. This latter point of view has been expressed in very forcible terms to the writer by the representatives of German and Swiss firms, both of whom sold their apple juices in this country. Far from attempting to bastardise the product by devious methods and reduce the price to the neighbourhood of 8d. a pint, such firms were selling in England very much larger quantities than were realised, at 1s. to 1s. 6d. per pint, and, until the beginning of April, the sale of the Swiss juice was progressing by leaps and bounds. Now importation is stopped and an opportunity is open for the development of a domestic English industry to produce a "quality" article of food for which there is an obvious demand.

The English Apple Juice Industry

Altogether, five firms have commenced the manufacture of pure apple juice, and are making use of the term "apple juice" prominently on the label. Dartington Hall, Ltd., may be mentioned by name as being worthy of honour for being the first concern to instal special plant for the production on a commercial scale of the unfermented juice. Storage is effected by a series of 5,500

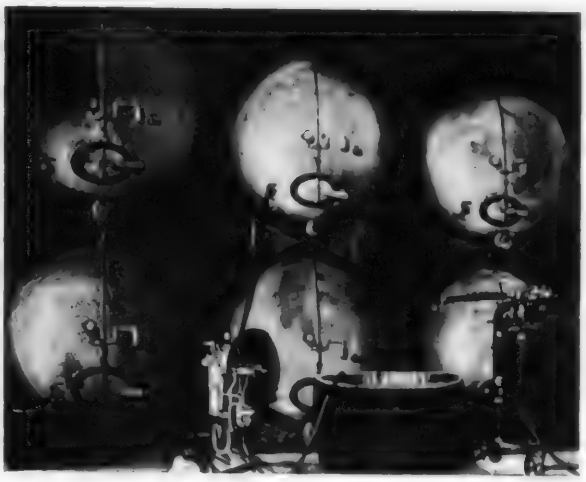
gallon steel tanks of the Boehi type, and the juice is impregnated with 120 lbs. CO_2 per square inch to prevent fermentation. Other firms are situated in Cambridge, Kent (which has two), and Worcestershire. Of these five concerns, three were definitely commenced by fruit growers, either individually or collectively, to utilise their surplus fruit. Two of the ventures have not put on much weight of late, but sales organisations on a small scale are expensive and wasteful of energy and time. However, one of the individual fruit grower's enterprises is flourishing and indicates how a well-conceived sales scheme can put the product across.

In parenthesis, allusion can be made here to the fact that the apple juice market was considered sufficiently attractive last summer for a well-known cider firm to introduce with a veritable blaze of publicity a soft drink made entirely from pure apple juice. It was given a trade name and apparently achieved a wide popularity during the season. Similar publicity for some of the other products would undoubtedly make a big difference to sales.

Direct Bottling or Canning

Those firms who do not use Boehi-type tanks for storage, bottle or can the juice direct and store the product in the ultimate container. This process is dangerous unless very adequate precautions are taken against fermentation and clouding of the juice. The point of view which considers that a few risks are worth taking in return for the cheaper method of storage is short-sighted and liable to lead to serious trouble. Pressure (CO_2) storage is perfectly safe and has the enormous advantage that blending is easily carried out on the juices themselves. Direct filling from day to day into small containers entails an accurate adjustment of the juice output for each day. Early varieties such as Beauty of Bath and Worcester Pearmain need acidification, whereas late sorts such as Lane's Prince Albert or Bramley's Seedling must have the excess acidity neutralised in order to make a palatable beverage. These inequalities in composition can be readily levelled out in the tanks, and, again, the use of a proportion of cider fruit can be easily arranged as a means of reducing acidity and conferring more "body" on the juice by means of the tannin content.

Pectinous deposits in apple juice bottled without use of pectin-decomposing enzymes.



A battery of 5,000-gallon pressure tanks for the storage of apple juice.
Courtesy: John C. Carlson.

As far as the writer is aware, the cold process in its entirety is not in use in this country. There are certain dangers associated with its use, and only the application of a rigorous system of sterilisation of plant, bottles and seals can prevent fermentation of the juice after bottling. But cold-processed juices are the very finest the writer has tasted, possessing a certain indefinable attraction (probably connected with the fresh apple character) not shared with juices which have been in contact with heat. Despite the pitfalls, one is tempted to misquote and say, "Cold process, with all thy faults I love thee still".

Technical Considerations

Within certain limits it is obvious that the research work at Long Ashton must lie outside the controversies of prices, profits, etc. Production of low-grade products needs less scientific backing—or at least a scientific backing of a different calibre—than does the manufacture of a high-grade product, and the aim of the investigations at Long Ashton has been and still is to produce from apples a beverage of the highest possible quality. Three separate points which are of special importance in this connection will be discussed here.

Flavour

The specific apple flavour in the liquid product is very liable to deterioration either by loss of intensity or a definite change into other less characteristic flavours. Some apple juices tasted blind can only with difficulty, if at all, be identified as having emanated from the apple fruit. In some juices noticeable changes occur within 24 hours of milling the fruit and expressing the juice. Just as a cut apple becomes brown, so also the juice under ordinary conditions exhibits browning which suggests that oxidation, most probably of an enzymic nature, is proceeding. These changes may be serious and can on occasion be fatal to the flavour of a juice, for it may deteriorate into an acidified, sweetened water solution, with a mere sensation of "something" other than sugar and acid in the background.

Isolation of Apple Flavour

This problem is being examined from two different points of view. Firstly, Dr. A. Pollard, the biochemist, is conducting an intensive search for the various chemical compounds present in apple juice which are responsible for the flavour. Already some interesting and unexpected compounds have been isolated and their composition established. In order to collect sufficient material for a long-term investigation, the juice from 1 ton of sound apples and free from any sign of fermentation was passed through the Kestner evaporator, using only the ester separator section. A colourless liquor was collected from the condenser outlet and a total of about 15 gallons was available for examination. The liquor had a strong smell of apples, and in some other cases it has been possible to identify the fruit by smelling the volatile fraction. Attempts to do this with the volatiles from Cox's Orange Pippin juice were unsuccessful on several occasions. The apple character was marked by an indefinite background aroma which was quite unpleasant. It was eventually shown to be due to the commencement of fermentation in the juice (indicating very clearly the need for using fruit before fermentation sets in), and a bulk of Cox's of unquestionable authenticity and condition were procured and the volatiles obtained.

Concentrated Cox Bouquet

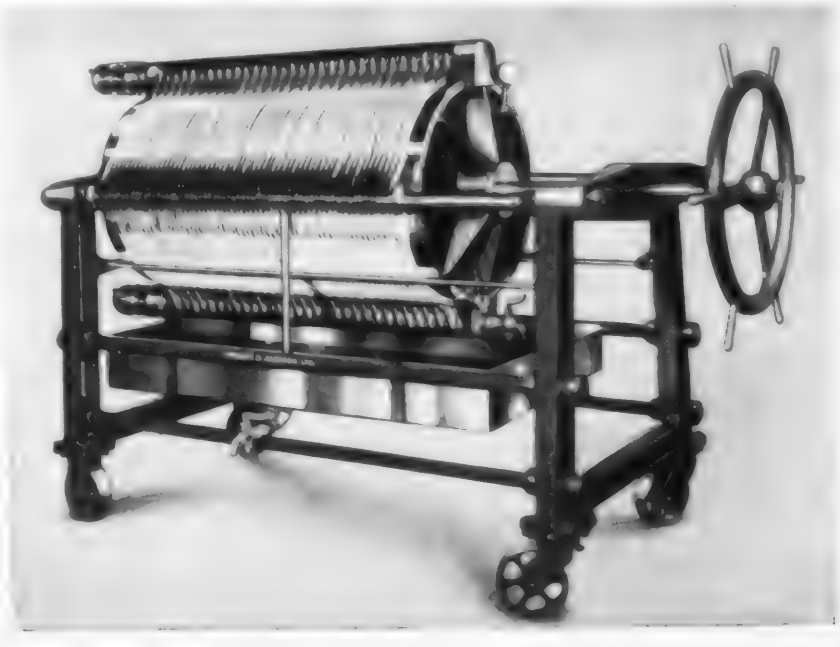
It is surely permissible to wax lyrical over the first concentrated Cox bouquet that has probably ever been culled from the fruits, and to say with Milton:

> "*Can any mortal mixture of earth's mould*
> *Breath such divine enchanting ravishment?*"

It is hoped that the information which Dr. Pollard is collecting will enable a more accurate approach to be made to the problem of preventing changes in flavour in apple juices. During the course of this work an interesting informal conference was being held at Long Ashton to discuss the work with scientists from Cambridge. A small quantity of dilute apple volatile material, recently produced, was sweetened with cane sugar and acidified with malic acid to approximately the same composition as apple juice. The imitation was quite remarkable and the product possessed an amazingly true apple character. On comparing this sample with a range of other juices, it became obvious that the cold-processed juices were the nearest to the "experimental" juice with respect to their aroma and fruit character.

Estimation of Oxidation

Secondly, the influence of oxidation on flavour is being examined by the use of deaeration. Hitherto there has been no satisfactory method of estimating oxygen in fruit juices. Titration methods were complicated and rendered useless by interference by the sugars, and Winkler's method was of no avail. Physical methods involving the boiling out of the gas in conical flasks gave unsatisfactory figures, but, during the last few weeks, Mr. Sills, working in the Fruit Products Section at Long Ashton, has succeeded in perfecting a method which gives figures for total dissolved gases, CO_2, O_2 and N_2 in the juice. By means of this piece of apparatus it has already been found that, in general, apple juices as they run from the press do not contain any dissolved oxygen, but that exposure to air leads to a gradual absorption of air, and to a definite removal of oxygen from the air by reason of chemical or biochemical combination. The effect of deaerating machines can now be placed on a definite quantitative basis, and the previous experiments of the writer which indicated the superiority of deaerated juices over those stored in the presence of air will be repeated under more satisfactory conditions.



The Ertel Germproofing Filter for use with Asbestos Filter Sheets. The filter illustrated will deliver from 20 to 50 gallons of liquid per minute.

Courtesy: Farrow and Jackson, Ltd.

Fermentation

As already mentioned, fermentation is the nigger in the woodpile in the apple juice factory. Apple juice, with its high content of nitrogenous materials, is peculiarly liable to develop fermentation, and once this has passed through the slow inductive period, a rapid development of gas and yeast deposit proceeds. Its suppression is all a matter of an infinite capacity for taking pains. In 1938 the writer spent some time in Germany in a factory using the cold process. When all the plant was assembled in the "sanctuary", or bottling room, a fat, dour German foreman arrived with a blow lamp and proceeded to work round the room and its contained plant with a sleuth-like tread, almost as if he could see the individual yeast cells scattered throughout the room. But he succeeded in obtaining a sterile atmosphere, sterile plant and finally in filling a sterile product into a sterile bottle. On the other hand, heat treatments do away with a certain risk of fermentation, but for absolute safety quite high temperatures are needed to sterilise the bottles before filling.

The question of sterile bottling cannot be dealt with in the course of this article, but full details of all types of juice processing are given in the Technical Communication No. 11, *Fruit Juices and Related Products*, published by the Bureau of Fruit Production, East Malling, Kent.

Plant

Until quite recently much essential equipment for apple juice production, especially by the cold process, was made in Germany and nowhere else. The Seitz filter was unique.

In the last year or two, however, the position has gradually improved, until now it is confidently asserted that all essential equipment can be obtained in England. The Boehi tanks can be made in Dudley and lined with English linings: the structural part of the sterilising filter is available in an equivalent form as English or American machines: the CO_2 impregnator sold from Germany for use with the Boehi tanks can be replaced by a British centrifuge-cum-impregnator. The unique sterilising filter discs which were for so long a monopoly of the German firm have counterparts which are now on sale in this country through two English, one American and one Swiss firm. Extensive trials at Long Ashton, which were only completed a month ago, have shown that these new forms of sterilising discs possess satisfactory sterilising power and an adequate throughput when compared with the forms of discs in use before the war.

Similarly special apparatus has been designed for the hot processing of apple juice and is available in units of all sizes to suit various needs.

(*To be continued.*)

CORRESPONDENCE

Steam Trap Capacity

DEAR SIR,

We would like to thank you and your contributor, Mr. R. E. Ashton, for the very helpful article in your April issue on Steam Trap Capacity.

As competitors of Mr. Ashton in the steam trap world, we feel that sound technical articles such as this are of very considerable value, both to the users of steam traps, who thereby may be induced to regard steam traps as no longer the Cinderella of the steam plant, and the makers of steam traps, who may be allowed to feel that they are doing work of considerable importance, at the present time, by helping the nation to reduce its fuel bills and to increase its production.

Yours faithfully,
L. G. NORTHCROFT, B.SC.(ENG.),
A.M.I.MECH.E., A.I.H.V.E.

Baking Powders

DEAR SIR,

With reference to your article on baking powders by S. Mendelsohn, in the April number of your Journal, I would just like to point out an apparent error on page 96, column 2, in the paragraph on phosphate baking powders. The words "phosphate" and "soda", in lines 6 and 7, and again lower down, appear to me to be transposed.

Yours faithfully,
F. C. BULLOCK,
Public Analyst, Health Department,
Grey Friars, Leicester.

[EDITOR'S NOTE.—Our correspondent is quite correct. The words "phosphate" and "soda" were obviously transposed.]

Keeping Quality of Flour—Saccharate of Lime

DEAR SIR,

In your issue of April 5, 1940, I was particularly interested in two points, the first on "Keeping Quality of Flour" (p. 82) and the second an enquiry regarding "Saccharate of Lime" (p. 114).

With reference to flour keeping quality, your comments were of necessity somewhat general in character, and a specific example of flour keeping quality might be of interest. A 140-lb. sack of true, straight run flour, "Agene" treated and milled in England from a No. 1 Northern (Manitoba) wheat in December, 1938, was recently tested. Its quality had not varied appreciably over a period of 14 months. The moisture content of the sample in 1938 was 15 per cent. approx., and it had been stored in the bakery, the temperature for the greater part of the time being 55 to 65° F.

With reference to the second point regarding "Saccharate of Lime" or "viscogen", the method of preparation recommended by Leach and Winton, *Food Inspection and Analysis*, p. 187, has always given good results:

Two and a half parts by weight of cane sugar are dissolved in 5 parts water. One part quicklime is slaked in 3 parts water. The sugar solution and strained slaked lime are shaken together and allowed to settle. The supernatant liquid is siphoned off and bottled for use.

Your correspondent will doubtless be aware that the use of viscogen is subject to legal restriction.

Yours faithfully,
S. WALTER BUTTERWORTH, B.SC. TECH., F.I.C.
The College of Technology, Leeds.

THE SCIENTIFIC FEEDING OF ANIMALS

A WAR-TIME PROBLEM

The principles and practice of feeding animals scientifically are wide in scope. In this article, the authors give broad indications—which should be of assistance to manufacturers of balanced rations and others—of remedial measures which can be adopted against the scarcity of many of the commonly-used animal feeding stuffs.

A. J. AMOS, Ph.D., B.Sc., F.I.C., and D. W. KENT-JONES, Ph.D., B.Sc., F.I.C.

THE FEEDING-STUFFS employed in the feeding of livestock and poultry can be classed under two heads. There are first of all the natural foods such as pasture, hay, roots, etc., and then what may be termed the supplementary foods, which include wheaten by-products, ground cereals, oil cakes, etc. At one time, these supplementary foods were utilised in a very rudimentary manner based mainly upon experience and results. Farmers were wont to buy a few simple meals, such as those produced by grinding maize, barley, oats and beans, and to feed these in various proportions depending upon past experience.

Nowadays, however, the position is vastly different; the determination of formulæ for balanced rations suitable for specific purposes has become a science in itself, while the manufacture of such scientifically balanced rations has grown into quite a large industry. This change has largely been brought about by the gradually growing tendency for livestock and poultry to acquire the status of nothing more or less than factories. Thus, to-day, both livestock and poultry are normally fed solely for the production of a given quantity of a commodity of definite quality within a certain period of time. The commodity required may take the form of eggs, of milk, or, of course, of flesh, as in the case of feeding for baby beef or for bacon. The progress which has been made in the compounding and manufacture of balanced rations is such that to-day there are accepted and reliable standards to which the nutritive composition of rations intended for various specific purposes should conform.

Present-day Difficulties

Under normal peace-time conditions there was available a wide range of materials suitable for inclusion in the formulæ of balanced supplementary foods and, moreover, there was an ample supply of each of these commodities. Since the outbreak of hostilities, however, there has been a marked scarcity, and in a number of instances a complete lack, of commonly used feeding materials, and indeed the problem of satisfactorily feeding livestock and poultry has become so acute that numerous stockbreeders have unfortunately been obliged to kill some of their stock. It is obvious that every effort should be taken to remedy this position, since it is of the utmost importance at the present time that the supply of home-produced foods should not be diminished, but should, if possible, be increased. Particularly should efforts be made to ensure the continuance of an abundant supply of good quality milk. The problem naturally has to be viewed from the two standpoints already mentioned—namely, that of the supply and utilisation of the natural foods, and that of the production of suitably balanced supplementary rations. The latter aspect is very important since, in very many instances, the natural foods supply little more than the maintenance requirements of the animal or bird—*i.e.*, the nutriment necessary to keep it alive and to maintain health without increase in weight, and it is the supplementary food in the form of a balanced ration which provides the majority of the extra nutriment necessary for the production of flesh, milk, eggs, etc.

In this article we propose to discuss some of these problems, and to indicate various steps which can be taken to meet this national emergency brought about by the scarcity of many of the commonly used feeding stuffs.

Utilisation of Natural Foods

Since the supply of balanced rations is, at the present time, insufficient to meet the normal demand, and indeed, despite possible improvement, is likely to continue so, it is important that the stockbreeder should make the fullest possible use of natural foods. In this connection, attention might be given to pasturage, much of which is capable of being considerably improved. Young leafy grass is an excellent feeding stuff for dairy cows, and during May and early June the grass on first-class pasture is often sufficient in itself for maintenance and the first two gallons of milk. From mid-June until the end of July such pasturage should suffice for the maintenance ration and for the production ration for 1 gall. of milk, while after July it should still be able to supply the requirements of the maintenance ration. Controlled grazing will do much to maintain quality in the pasturage, while the quantity may often be improved by suitable manuring. Furthermore, there is the possibility of extending the grazing season by manuring and later by re-seeding with a mixture of suitable seeds.

Grassland is, of course, also of help in the raising of both pigs and poultry. In the latter case, birds kept on the free range system obtain appreciable quantities of protein from the young grass, insects and worms, and this may help when protein concentrates are scarce.

Home-grown foods, such as hay, silage, mangolds, swedes and potatoes can usefully be employed in the feeding of pigs, but should be supplied only to mature stock. When the supplementary foods are scarce, satisfactory partial substitution can be made with the foods mentioned. Thus, mangolds or cooked potatoes can take the place of some barley, while hay, if it is of good quality, can to some extent replace middlings and thus spin the latter out.

Mangolds, swedes, potatoes, etc., are well liked by poultry, and may be very usefully employed when there is some lack of the supplementary rations. It is important, however, to ensure that the birds are not supplied with too great a quantity of these foods or they will tend to overfeed themselves and thus be unable to consume sufficient of the concentrated foodstuffs.

War-time Supplementary Foods

Turning to the question of the supplementary foods, there are certain steps which can be taken by provender millers in general in order to relieve the situation, while there are also various substitutions and re-arrangements which, although not of general applicability, can never-

theless be made with advantage when opportunity offers. Recommendations as to the latter method of meeting the situation will be given later in this article, but we propose to discuss in this paragraph the ways in which most manufacturers of balanced rations can make an effort to meet the scarcity of many of the commonly used ingredients of animal and poultry feeding-stuffs. The first step which can be made in this direction is to produce rations which possess a rather lower nutritive value than the peace-time standard. Under normal circumstances, when there are ample supplies of numerous suitable ingredients, there is much to be said for the production of good rich rations, but it will be found that the standards adopted under peace-time conditions for many rations will permit of some reduction in nutritive value being made without the suitability of the ration for the purpose for which it is intended being seriously impaired. Appreciation of this fact is reflected in a recent official recommendation that dairy rations should be compounded upon a basis of about 18 per cent. of albuminoids as against the figure of about 20 per cent. or even higher which many firms work to in normal times.

Another method by which some of the present difficulties can be met is the employment of ingredients which are not in common use in normal times. The ample supplies of certain common feeding materials which are available under peace-time conditions have led to the basic formulæ of many of the standard rations becoming more or less stereotyped, but it will be found that opportunities occur to purchase materials which, although perhaps never considered by the provender miller in question under normal circumstances, will, nevertheless, at the present time, meet a given requirement in a ration and prove of definite aid in balancing the formula. There exist, for example, a number of materials which are quite wholesome and possess useful feeding values, although they have not found a popular use under peace-time conditions. Examples of such materials are sesame cake, sunflower seed cake, rape cake.

The provender miller will also find it helpful at the present time to produce some all-purpose rations. Thus, instead of compounding three separate pig rations for sows and weaners, growers, and fatteners respectively, the manufacturers can meet the present situation by producing a single ration which is reasonably suitable for all these three types of pig. A ration of this type naturally cannot conform to the usually accepted standard of each of the rations which it is intended it should replace but must effect a compromise. It is, however, possible so to construct such rations that they can be fed for several purposes with satisfactory results.

Use of Substitutes

In the succeeding sections, we intend to discuss under appropriate headings the substitutions and rearrangements which, under the present difficult and abnormal circumstances, may be found helpful in the compounding of rations of various types. Before proceeding to do this, however, we propose to offer some general advice concerning the use of substitutes. The substitution of a common feeding stuff by one which is not in common use should, wherever possible, be accomplished in stages so that the animal or bird gradually becomes accustomed to the new ingredient. Obviously care should also be taken that the proportion in the ration of any one ingredient is not increased to such a level that, although a satisfactory balance is maintained between proteins, fats, carbohydrates, fibre, etc., the ration becomes unpalatable or liable to cause digestive troubles.

The supply of any ingredient which is particularly attractive or flavoury or for which the stock has a distinct liking should be eked out so that a proportion of this material can be retained in the ration for as long as possible.

In many instances, and as long as it will be allowed, efforts will be made to use as much wheatmeal as possible in various rations, but, when this is replacing mainly weatings, it should be borne in mind that the protein content of wheatmeal produced from native wheat is lower than the protein content of weatings made from the average grist.

Another point to remember is that where fish meal is not obtainable and the necessary protein is obtained from vegetable sources—*i.e.*, from cakes and meals of high protein content—it may be necessary to increase the mineral supplement to make up for that which would normally be supplied by the fish meal.

Cattle

Some of the common ingredients of peace-time cattle rations which are now scarce or unobtainable can, as opportunity offers, be replaced by various substitutes. In this article, of course, it is only possible to consider a few of the many possibilities.

Dried distillers' grains, dried brewers' grains and ground malt culms are very useful materials for inclusion in the rations of cattle and dairy cows. These materials are quite high in protein content and, in the case of the grains, have fairly high oil contents. Naturally, their fibre contents are also high, but this is not so disadvantageous when they are being employed in cattle rations. The average compositions of these materials according to Bulletin 48 of the Ministry of Agriculture and Fisheries are as follows:

	Oil %.	*Protein* %.	*Fibre* %.	*S.E.*
Dried brewers' grains ...	6·4	18·3	15·2	48·3
Dried distillers' grains	11·6	27·7	10·1	37·2
Ground malt culms ...	2·0	24·4	14·0	43·4

Rice meal is another material which, when available, can find a useful place in rations for dairy cows and can be employed partially to replace flaked maize. It is not particularly high in protein content, but has a high oil content and a useful starch equivalent.

Cotton cake, which is a useful protein concentrate, can be used in the undecorticated state for cattle, since the ruminants are able to deal satisfactorily with fairly high quantities of fibre.

If necessary, a ration suitable for dairy cows could be made from a mixture of bean meal or pea meal, with one or more of the starchy foods.

Materials of a distinctly unusual nature, such as dried fruits, can be, and indeed have been, used satisfactorily in dairy cubes.

Sheep

Since the conditions vary from district to district it is not possible to offer suggestions suitable for universal adoption, but some of the hints given below are likely to be found helpful in certain localities, and in any event will indicate the lines along which modifications can be attempted.

Ground malt culms, the average composition of which is given under "Cattle", are an excellent material for inclusion in sheep rations. Dried distillers' grains can be used in sheep rations, but should only be used in limited proportions. Brewers' grains are found more suitable for sheep, and these can be used in substitution for bran in the ration. Sugar beet pulp is suitable for the partial substitution of bran or of oats in rations for sheep. This material is not very different from oats in protein content, but is low in oil content and rather high in fibre content.

Undecorticated cotton cake is a suitable ingredient for sheep rations, but neither this nor even decorticated cotton cake should be fed to lambs except in small quantities. Materials which possess protein contents similar to that of undecorticated cotton cake and which can be used partially to replace the latter in sheep rations are:

	Approx. Protein Content (Per cent.).
Lentil meal	25·5
Bean meal	25·5
Pea meal	22·5
Maize gluten feed	23·5
Palm kernel cake	18·0
Coconut cake	21·0

Locust beans, although of low protein content, are very well liked by sheep and a small proportion in a ration is a distinct aid to the palatability.

Pigs

In this section are given certain substitutions which can be adopted in pig rations as emergency measures. They are, however, only a selection and by no means exhaust the possibilities. In the first place, advantage should be taken of household waste, commonly called "swill". This should be boiled for at least an hour before use and must, of course, be supplemented by other rations.

In rations for breeding sows and boars, the weatings can be partially replaced by palm kernel cake or by coconut cake, but these should not constitute more than about 15 per cent. of the ration. The materials are not, however, to be recommended for other pig rations in proportions as high as this on account of their high oil content. Weatings can also be replaced in pig rations by rye middlings when these are available up to about 25 per cent. of the ration or by a mixture consisting of 70 per cent. crushed oats, 20 per cent. coconut cake, and 10 per cent. decorticated ground nut.

In cases of necessity barley meal, which normally constitutes a considerable portion of the fattening ration, can be largely replaced by flaked maize, maize meal, wheatmeal and rye, should any of these substances be more freely available. Each of these products has a protein content in the region of that of barley, while the latter two also show similarly low oil contents. Flaked maize and maize meal, however, are higher in oil content and, if used in too high a proportion in a fattening ration intended for the final stages of fattening, may tend to lead to soft fat in the carcase.

Wheatmeal, which is often used in rations at the present time, is being employed in pig rations in higher proportions than would have been considered desirable under peace-time conditions. The proportion that can be used in any given ration will, of course, depend upon the other ingredients present, the main point being that gluten formation in the stomach must be avoided. Government restrictions on the use of wheatmeal in such rations may, however, be introduced.

Ground malt culms have been employed in pig rations, but it is not advisable for them to constitute more than 5 per cent. to 10 per cent. of the ration. Dried brewers' grains have also been used in pig rations, but, as many breeders consider that they are not easily digested by pigs, the proportion in which they are incorporated in a mixture should be kept low.

Fish meal, which is very scarce at the present time, can be satisfactorily replaced by mixtures consisting of cakes or meals of high albuminoid content and meat and bone meal. Thus, it has been recommended that 10 parts of fish meal could be replaced by 5 parts of 50 per cent. meat and bone meal, 3 parts soya bean meal and 3 parts bean meal. Although a number of the proteinous cakes can be used in pig rations, it is generally accepted that feeding of cotton cake to pigs is not to be recommended.

Ripe acorns contain a high proportion of digestible carbohydrates and can be included in pig rations to the extent of 10 per cent., except in rations intended for in-pig sows. In the fresh state they have a starch equivalent of slightly over 40, while, when dried, their starch equivalent is about 70.

Poultry

Whether any of the suggestions offered in this section can be adopted by a given manufacturer will, of course, depend upon local conditions. It is hoped, however, that even where they cannot be put into practice they will at least be of assistance in suggesting other possibilities.

Decorticated and extracted ground nut meals and extracted soya bean meal are quite suitable for inclusion in poultry rations. They can be used in reasonable proportions in the rations for older birds and can be fed even to chicks to a limited extent. If possible, however, these substances should be combined with sources of animal protein. Linseed cake is appreciated by poultry, but cotton cakes and meals are not recommended. Ground malt culms can be usefully fed to poultry and can form up to 5 to 10 per cent. of the ration.

Fish meal can, when necessary, be replaced by mixtures of meat and bone meal with proteinous meals on the lines suggested in the section dealing with pigs. When such a substitution is made in a poultry ration it is important to ensure that it does not result in a deficiency in mineral matter.

Costings

The Feeding Stuffs (Maximum Prices) Order, 1940,* not only fixes official prices for the majority of the ingredients used in manufacture of balanced rations, but also determines the maximum profit to which a manufacturer of balanced rations is entitled. As a result of this Order, therefore, there exists for any particular ration a maximum permissible selling price, the actual figure depending upon the composition of the ration. If a provender miller wishes to obtain the full profit allowed by the Order, it is necessary that he should be able to determine this maximum selling price. In order to arrive at this figure, several steps are necessary. In the first place, the so-called "appropriate price" of each ingredient is obtained by reference to the First Schedule of the above-named Order. From each of these "appropriate prices" is then deducted the allowance permitted by the Order when the buyer of the material is a provender miller. This allowance varies with the material, but can be readily ascertained from the instructions in the Order. Thus, in the case of maize meal, for instance, the deduction to provender millers is 10s. per ton; in the case of ground nut cake 5s. per ton and in the case of beans 7s. 6d. per ton. A further deduction of 9d. per ton is then made in respect of War Risks Insurance charge. This final figure —that is, the "appropriate price" less the permissible deduction to a provender miller, less a further 9d. per ton—represents the official cost price of the ingredient in question to a provender miller, prior to delivery at his mill. To this sum is then added the cost of conveyance of the material to the mill, and this final sum represents the official cost price of the ingredient to the miller and is the one which must be used in subsequent calculations. In the case of ingredients which are not quoted in the First Schedule of the Order, the actual cost price at the mill to the provender miller is the figure to be taken.

The total cost price of the materials in the ration is then calculated by using these determined official cost prices in conjunction with the proportions in which the various ingredients are present. To this total cost of the ingredients is then added the cost of manufacture and the cost of the bags in which the ration is packed, and the sum thus arrived at represents the final total cost price of the ration. The maximum permissible selling price of the ration is obtained by adding to this total cost price the maximum profit allowed by the Order, namely, 30s. per ton. An actual example will perhaps make the whole process of calculation quite clear, and

* *Since this was written, minor alterations in some of the official prices later quoted have been made, but the method of calculation is unchanged.*

for the purposes of this calculation we will make use of the formula of a dairy ration which we examined quite recently. We do not propose to discuss the composition of this ration from the point of view of war-time feeding stuffs, but merely to utilise it to show how the costing figures should be calculated. The formula was:

10	*per cent.*		*Bran.*
5	,,	,,	*Coconut cake (home produced).*
5	,,	,,	*Flaked maize.*
5	,,	,,	*Weatings.*
15	,,	,,	*Extracted ground nut meal.*
10	,,	,,	*Maize gluten feed (22 per cent. albuminoids).*
17·5	,,	,,	*Palm nut kernel cake.*
15	,,	,,	*Wheatmeal.*
15	,,	,,	*Ground malt culms.*
2·5	,,	,,	*Minerals.*

The "appropriate prices" of those ingredients listed in the First Schedule of the Order are as follows: (*See footnote page 137, col. 2.*)

	Per Ton. £	*s.*	*d.*
Bran	7	5	0
Coconut cake	8	12	6
Flaked maize	10	10	0
Weatings	7	5	0
Extracted ground nut meal ...	8	17	6
Maize gluten feed	9	2	6
Palm nut kernel cake	7	15	0
Malt culms	6	10	0

The "appropriate prices" of the bran, flaked maize, weatings, maize gluten feed and malt culms, all of which occur in Part A of the First Schedule of the Order, are reduced by 10s. per ton when bought by a provender miller and by a further 9d. per ton for War Risk Insurance charge.

The coconut cake, extracted ground nut meal and palm kernel cake occur in Part B of the First Schedule of the Order, and hence cost officially 5s. per ton less than the "appropriate price" when bought by a provender miller, less a further 9d. per ton for War Risk Insurance charge.

In every case, however, the cost price thus arrived at is increased by the cost of cartage to the mill, which, in this example, we will assume to be 5s. per ton.

Method of Calculation

The final cost prices to the provender miller at the mill of those ingredients quoted in the Order are, therefore:

Bran: £7 5s. *less* 10s. 9d. *plus* 5s. = £6 19s. 3d. *per ton.*

Coconut cake: £8 12s. 6d. *less* 5s. 9d. *plus* 5s. = £8 11s. 9d. *per ton.*

Flaked maize: £10 10s. *less* 10s. 9d. *plus* 5s. = £10 4s. 3d. *per ton.*

Weatings: £7 5s. *less* 10s. 9d. *plus* 5s. = £6 19s. 3d. *per ton.*

Extracted ground nut meal: £8 17s. 6d. *less* 5s. 9d. *plus* 5s. = £8 16s. 9d. *per ton.*

Maize gluten feed: £9 2s. 6d. *less* 10s. 9d. *plus* 5s. = £8 16s. 9d. *per ton.*

Palm nut kernel cake: £7 15s. *less* 5s. 9d. *plus* 5s. = £7 14s. 3d. *per ton.*

Malt culms: £6 10s. *less* 10s. 9d. *plus* 5s. = £6 4s. 3d. *per ton.*

The wheatmeal and the minerals, for which appropriate prices are not quoted in the Order, actually cost delivered at the mill in this particular instance £8 15s. per ton and £8 per ton respectively.

Employing these official final cost prices of the ingredients and the proportion in which each ingredient is present as shown above, we arrive at the following total cost price of the ingredients:

					Per Ton. £	*s.*	*d.*	£	*s.*	*d.*
10	*per cent.*		*Bran*	@	6	19	3		13	11
5	,,	,,	*Coconut cake* ...	@	8	11	9		8	7
5	,,	,,	*Flaked maize* ...	@	10	4	3		10	3
5	,,	,,	*Weatings*	@	6	19	3		7	0
15	,,	,,	*Extracted ground nut meal* ...	@	8	16	9	1	6	6
10	,,	,,	*Maize gluten feed*	@	8	16	9		17	8
17·5	,,	,,	*Palm nut kernel cake*	@	7	14	3	1	7	0
15	,,	,,	*Wheatmeal* ...	@	8	15	0	1	6	3
15	,,	,,	*Ground malt culms*	@	6	4	3		18	8
2·5	,,	,,	*Minerals*	@	8	0	0		4	0
			Total cost price of ingredients per ton of ration					£7	19	10

Assuming that the cost of manufacture is 10s. per ton and that the cost of the bags in which the finished ration is packed is charged at 10s. per ton, the total cost price of the ration then becomes £7 19s. 10d. + 10s. + 10s. = £8 19s. 10d. per ton.

As the Order permits a maximum profit over and above the cost of ingredients, the cost of manufacture and the cost of bags at 30s. per ton, the maximum selling price of this ration will be £8 19s. 10d. + 30s. = £10 9s. 10d. per ton.

Conclusions

A number of suggestions have been put forward which it is hoped may prove of assistance both to stockbreeders and to manufacturers of balanced rations at the present time when there is a scarcity of many of the commonly used animal feeding stuffs. The principles and practice of feeding animals scientifically are wide in scope, and it has been impossible in this short article to do more than to provide broad indications of remedial measures which can be adopted. In any event, the promulgation of precise and specific recommendations would be inadvisable owing to the fact that circumstances vary so very greatly from district to district.

The necessity of employing less commonly used ingredients often raises interesting problems, while further complications are introduced by the numerous regulations laid down in Government emergency Orders. The new and continually changing problems with which the provender miller is faced to-day leave no doubt that the need for, and the benefit to be derived from, scientific advice and control in the manufacture of balanced rations is even greater now than before the war.

If the business is to prove profitable, it is important that costings should be carefully watched and calculated on the lines suggested. If this is not done, it will often happen that an incorrect selling price is charged and quite possibly insufficient profit realised. Great care is wanted at the present time to compound a ration which is both suitably balanced and profitable.

It is hoped that this brief survey of the general position will not only interest but also help those upon whom rests the heavy responsibility of satisfactorily feeding the livestock of this country during the present critical period.

CORRECTION

Steam Trap Capacity

By a printer's error on page 92 in FOOD MANUFACTURE, April issue, the caption to the diagram at foot of column 2 was incorrect, and should read, "*Diagram showing method of testing steam traps for continuous discharge 'hot' capacity*".

JAM IN WAR-TIME

A Discussion on Possible Modifications in Methods of Manufacture during the Coming Season.

O. B. DARBISHIRE, B.Sc., A.I.C.

THE PROBLEM of producing and marketing jams on the large scale has been differently attacked in different countries.

In this country the preference is for jam sufficiently firm in set and containing a sufficient proportion of sugar to be safely transported and stored in an open unsterilised pack, with a parchment or similar closure.

"Pulp" Jams

"Pulp" jams are also consumed here in considerable quantity. This fact is due to the shortness of the various fruit seasons, and to the great demand for jams of moderate price. The fresh fruit is prepared by the simple process of cooking and preserving with sulphur dioxide, leaving the more elaborate process of boiling and packing the jam to be carried out at leisure throughout the year. The sulphur dioxide evaporates almost completely during boiling, and very satisfactory jams can be made in this way, but something of the freshness of the fruit flavour is lost, and it is still usual to make the highest class jams from fresh fruit in the season.

In some other countries, notably in the United States, jam is regarded as a kind of stew or conserve, to be eaten as a separate course, and not merely as a flavouring for bread. American jams are accordingly lower in sugar content and considerably slacker in set than those of English make, and the food laws insist on a very high percentage of fruit. The jams are frequently boiled in vacuum evaporators to preserve their flavour, and are sold in a closed and sterilised pack, since the low sugar content and slack set render them liable to mould growth or fermentation if not so treated.

Sulphited (preserved) fruit is not permitted, and jam is made either from fresh fruit in the season or from cold stored fruit.

In Holland, also, the popular conception of what a jam should be differs greatly from ours, as is shown by their recent legislation on the subject. This insists inevitably on jams extremely rich in fruit and rather low in sugar.

War Conditions

It is interesting to examine the possibility of jam manufacturers being compelled by the present abnormal conditions to modify their methods.

First of all, sugar for jam manufacture is rationed to 70 per cent. of normal consumption. The fact that sugar for private use is also rationed may result in a good demand for jam and other sweet foods, and manufacturers will naturally wish to make their allowance go as far as possible.

Secondly, it remains to be seen how the rapid transport of fruit to the factories will be affected in the coming season, and whether irregular deliveries will make it necessary to pulp and preserve fruit which would normally be made direct into fresh fruit jam.

And, thirdly, a considerable quantity of cheap jam is made from sulphited pulp imported from abroad, and here again the manufacturer may be hampered by transport difficulties.

The delays of overseas transport have already made themselves felt in the past winter, and marmalade manufacturers are finding their season extending far beyond the normal date.

The rationing of sugar, and the possibility of "stretching" the available supplies, provide some interesting problems, and these will be considered in greater detail.

Sugar Substitutes

From the purely scientific point of view, quite a number of substitutes for sugar suggest themselves.

It should be remembered that sugar performs three distinct functions in jam. Besides sweetening the product, it acts as a preservative, and it enables the fruit juices present to give the jam its natural "set."

There are few other substances which perform all these functions to quite the same degree as sugar. Moreover, some of these are impracticable for reasons of cost, or because they are not obtainable in such quantity as would enable them to eke out the sugar supplies to any great extent, but it is instructive to consider them on their merits, and see to what extent they fulfil the necessary conditions.

Sugars

First among the substitutes for cane sugar are the other sugars or natural or commercial sugar-containing products.

Crude sugar and molasses may be passed over as being of no particular interest. Scientifically they do not differ essentially from sugar, and from the practical point of view any form of sugar or molasses sufficiently good in quality to be considered in jam manufacture is likely to be subject to the same restrictions as sugar.

Glucose and its various commercial varieties (glucose syrup, glucose chips, and pure dextrose) may next be considered.

Glucose syrup is actually used in some countries as a partial substitute for sugar in jams. It is, however, less satisfactory, and it is not usual to replace more than a portion of the cane sugar by glucose. For one thing, glucose is less sweet than cane sugar, and if a considerable quantity were used this difference would become quite noticeable.

Secondly, on theoretical grounds, glucose would not be expected to be as good a preservative as cane sugar used in the same concentration. This is due to the presence, in commercial glucose, of a rather large proportion of dextrin, a substance of extremely high molecular weight. There does not seem to be much definite information available as to whether this theoretical fact is borne out in practice. Jams containing a proportion of glucose have been manufactured in considerable quantities, and are still produced in some countries, and it is certainly possible to turn out quite a satisfactory product in this way.

Honey is normally out of court on account of its high cost and its rather prominent flavour. Theoretically, however, it would be quite possible to replace a portion of the sugar in jam by honey, and though the product might differ from a normal jam, some special kind of preserve might be prepared in this way, making definite use of the characteristic flavour of the honey.

Complete replacement of sugar by honey is not practicable, as most honeys contain a sufficient proportion of dextrose (a sugar of rather low solubility) to cause crystallisation.

One other possible source of natural sugars is provided by sweet fruits, such as dates, raisins or sultanas. Their use has, in fact, been advocated in advertisements, but it is easy to see that the same difficulty applies here as in the case of honey: a jam containing part of its sugar in the form of raisins or sultanas would not be a normal pure fruit jam but a mixed conserve of a rather special type.

Polyhydric Alcohols

Several of the polyhydric alcohols will perform all the functions of sugar in jam.

The most widely known of these is glycerol, a trihydric alcohol, more commonly known as glycerine. This can be used to replace sugar completely, and some firms market jams containing glycerol for the use of those who require a sugar-free diet. Glycerol jams are, however, hardly suitable for general use. Their taste, though sweet, has a slightly burning quality about it, and the cost of the glycerol is relatively high.

Other substances in this class are the hexahydric alcohols, such as mannitol, dulcitol and sorbitol. These are crystalline substances, which have a moderately sweet taste, and are free from the burning taste of glycerol. These substances occur naturally in certain plants; mannitol in manna, dulcitol in certain barks, and sorbitol in the berries of the mountain ash. They are not very plentiful, but they are recognised as being extremely valuable sweetening agents for diabetic foods. Sorbitol is manufactured for this purpose in fairly large quantities, but the cost is rather high for general use.

Invert Sugar

The inversion of sugar provides an interesting possibility for making the most of the sugar put into jam.

Sugar, when heated with acids (*e.g.*, the natural acid of the fruit) is decomposed into two simpler sugars—*d*-glucose (dextrose) and *l*-fructose (lævulose). In this process it combines with water and increases in weight. In fact, 95 lb. of sugar produce 100 lb. of "invert sugar" as this mixture is called. Invert sugar is approximately as sweet as cane sugar, and its preservative properties are theoretically superior, but in any case it may safely be taken as equal to cane sugar as a preservative. It is therefore an economy in jam making to work with as high a degree of inversion as possible, since the same final sugar concentration can be obtained with a smaller initial quantity of sugar.

As all jam manufacturers know, however, there is a limit to the degree of inversion that may be safely used. It is variously placed at between 40 and 50 per cent. of invert sugar. In any case, whatever figure we accept for the actual limit, over-inversion is liable to lead to the objectionable crystallisation of dextrose from the jam. Therefore, if any use is to be made of high inversion as a means of economising sugar, a very strict control must be exercised on the degree of inversion. Even so, the amount of sugar saved could only be small, being limited to a saving of 5 per cent. on the amount by which the average invert sugar content of the jam is increased.

Sterilised Packs

As has been mentioned, low sugar preserves, sold in a sealed and sterilised pack, are popular in the United States.

These would provide a simple way of making the sugar go further, but it does not seem likely that the British public would take kindly to jams which cannot be relied on to keep in good condition after the jar has been opened. It is all a matter of point of view. The American appreciates the fruity flavour of his jams and accepts their non-keeping properties as we accept the non-keeping properties of tinned fruit, while we might be inclined to regard a non-keeping jam as something of inferior quality.

The question of adapting ourselves to circumstances and especially of making the most of the limited sugar supplies has here been introduced rather from the theoretical side. In this way there have been brought to notice several methods of attacking the problem, and though some of these are of purely theoretical interest, others may lead to quite practicable suggestions.

The legal aspect of the problem and the question of supplies of the suggested materials have hardly been touched upon at all. The legal position of jams, except as regards their minimum fruit and soluble solids contents, is not very clearly defined, and as for supplies of raw materials, it seems possible that any likely sugar substitutes will eventually be subjected to some form of control.

NEWS FROM THE INDUSTRY

Unique Bomb-Proof Shelters

Further A.R.P. arrangements recently made by Crosse and Blackwell include the building of 14-in. brick wall shelters inside factory basements where ceilings were débris-proof. These shelters are provided with emergency exits into the street by way of steel doors, and provision is also made for the usual first-aid emergency and escape equipment, etc., also lavatory accommodation for male and female personnel.

As building space is at a premium in this locality, it was decided to excavate under the main steel frame building and build reinforced concrete shelters for the personnel in this particular building. The shelters were built between the footings of the steel stanchions of the building, and this arrangement resulted in a number of long subterranean shelters separated from each other by solid earth and steel, and they are constructed with emergency exits along the ceilings and also into the open street. The staircases into the shelters lead from the factory yard and are protected by blast-proof walls. These are unique débris-proof shelters, and should rank among the safest in the country. The whole scheme of A.R.P. precautions is linked up with a central broadcast control station, which is linked to a large number of loud-speakers around the factory. This electrical equipment provides many other advantages. It is in daily use for the purpose of "paging" senior members of the management, also for signalling the factory starting and stopping times (as the blowing of outside hooters is now officially forbidden), and it is invaluable for broadcasting information and instructions to the factory personnel. During rest periods and at certain prescribed times during the day music is broadcast, either direct from the B.B.C. or by gramophone records.

* * *

Shop Window Lighting and Illuminated Signs

As a result of the new Lighting Order dealing with shop window lighting just published, shops and stores are now permitted to install in their windows special display cabinets of various sizes illuminated to a low intensity with certain limitations as regards cut-off. For use in such cabinets the General Electric Co., Ltd., has designed a special type of fitting which complies with the British Standard Specification (No. ARP/35).

The G.E.C. display cabinet fitting is constructed in such a way that only a proportion of the light from the lamp is allowed to strike the goods on show, thus keeping within the maximum permitted intensity of illumination.

Illuminated signs of limited overall dimensions and luminous area may now be exhibited outside shops and stores. Since such signs must be inconspicuous at a distance of 100 feet, which means that the maximum brightness of any illuminated area must not exceed 0·02 equivalent foot-candle, a very large proportion of the signs at present in use will have to be either replaced or altered to comply with these conditions. For this purpose the Company is manufacturing a range of box signs with suitable interior fittings to give the permissible illumination, and also a range of conversion units for reducing the intensity of existing signs.

* * *

Particle Size Meter for Flours

The apparatus consists of a tank in which a suspension of the particles, dispersed in water by a mechanical stirrer, is allowed to settle under gravity. While settling takes place the particles become sorted out so that a sample taken at a fixed depth after a given time will include in their original concentrations all those particles whose size is associated with a velocity insufficient to carry them beyond this point in the time concerned.

In this apparatus the "sampling" takes place continuously and is performed by a beam of light passing across the tank and falling upon a photo-electric cell. The current from the latter, recorded by a mirror galvanometer, is a measure of the "weight" of the sample, and the deflection of the galvanometer may be noted from time to time on a scale. This record then forms the "distribution curve" for the specimen. Quite a small quantity of the solid (less than 1 grm.) may be used and the method of sampling has the merit of not disturbing the sedimentation. It will work with particles down to 1 micron in diameter.

The apparatus, supplied by A. Gallenkamp and Co., Ltd., is used in the Dover Laboratories by D. W. Kent-Jones, Ph.D., B.Sc., F.I.C., and A. J. Amos, Ph.D., B.Sc., F.I.C., and is described in the *Journal of Agricultural Science*, vol. xxiv, July, 1934, *Journal of Scientific Instruments*, vol. xiii, July, 1936, *Journal of the Society of Chemical Industry*, August, 1939, vol. lviii, No. 8, p. 261.

* * *

New Fish Pastes

At their factory in Lofoten, A/S Hermetikk of Oslo have been experimenting with pastes containing cod liver oil and cod roe. They obtained the fresh materials as soon as two hours after the fish had left the water. The makers claim that it has a very high standard as a foodstuff, and stress its vitamin A, B_1, B_2 and D content.

We have tried the products and they have a very attractive taste. According to an examination made by the Canning Industry Research Laboratory at Stavanger, 4 grms. of the paste has the same vitamin A and D content as 1 grm. of cod liver oil.

* * *

Refrigeration Equipment

With the object of marketing and manufacturing refrigeration and air conditioning equipment in all its phases, Stanelco Products, an offshoot of Standard Telephones and Cables, Ltd., have made sales and manufacturing agreements with three American manufacturers, and are able to offer a very complete range of high-grade refrigeration equipment.

Development is continually going forward, and the manufacturers claim that users of their equipment can be assured that not only are they of the most advanced and efficient design, but that they are based on many years' sound and thorough experience.

The Bulletin recently issued by the company deals with the application of refrigeration to such selected trades as food, chocolate and yeast manufacture, baking, etc. It describes and illustrates the special features of Stanelco condensing units, evaporators and cooling units and contains photographs of typical installations in biscuit factories and food stores.

They state that their cold rooms are made of the highest grade timber and insulating material, and are assembled under expert supervision. All joints are rabbeted and put together with mastic, and all cork insulation is double sealed in position with molten bitumen. The floors are reinforced granolithic cement, dished with coved angles to protect the walls. The doors are made and fitted with particular care, and incorporate steel straining bars to pre-

vent warping. The door sills are fitted with heavy galvanised plates for protection.

The enamelled steel finish is made from selected sheets, which are subjected to a special zinc treatment, ensuring a positively rust-proof material. The enamel is a substance which, when heat treated, becomes a form of bakelite and is applied and treated in three separate coats, thus forming a three-ply bakelite finish.

* * *

"Economy" Lunch

During his speech at a lunch given by Easiwork, Ltd., Alderman W. H. Church, J.P., L.C.C., who was in the chair, said that he had been to a good many lunches in his time, but this was the first one where the menu told exactly how the dishes were prepared, and where they were mainly made up of by-product materials.

For instance, here is one item:

> FRIED SOLE. POTATO FRITTERS.
>
> The sole is fried in pure fat recovered from bones, which might have been sold for fertiliser. The potato fritters are prepared in a batter of soya flour, which adds protein, thus providing an inexpensive food containing fats, carbohydrates and proteins.

The occasion was the visit of the Mayor and Corporation of Hammersmith, members of the Local Food Committee and the Press to the Easiwork Stew Shop, at Boscombe Road, Shepherd's Bush, which is called "an experiment in centralised cooking." The shop is on the lines of a central depot, which will provide soups and stews at as near cost as possible, the customers bringing their own receptacles.

Considerable interest was evinced by the visitors in the suggestion which was put forward that as a result of the experience up to date and as a means of strengthening the food defences, a municipal canteen staffed with one paid assistant and the remainder voluntary workers should be organised to prepare soups, etc., to be distributed hot in selected areas by mobile kitchens. The mobile kitchens might be classed as A.R.P. vehicles, and in the case of air raids return for duty as ambulance auxiliaries, the personnel being classed as A.R.P. ambulance drivers.

Such central cooking and preparation of carefully balanced soups by voluntary workers with Government or municipal assistance for its distribution should contribute to the ensuring of better nutrition of the poorer 30 per cent. of the population, whose need is pointed out in the recently published book by Sir John Orr and Mr. David Lubbock, *Feeding the People in War-time.*

Tomato Powder

We have recently received an interesting sample of "Mireem" Tomato Powder made by Atomised Food Products, Ltd. We are informed that the preliminary experiments were made from fresh tomatoes, but as the cost of the raw materials is prohibitive for commercial purposes, tomato *purée* was substituted. This *purée* is converted into a suitable state to be fed into an atomising plant.

This powdered product has the advantage of keeping indefinitely and is soluble in water; the process has conserved the original taste of tomatoes, and should prove of interest to all food manufacturers who have occasion to use tomatoes in their products. It has been certified by a Public Analyst to be entirely free from preservative.

* * *

Sultanas

The Ministry of Food placed on record on April 16 appreciation of the support from the food industry in the campaign for stimulating the consumption of sultanas. This campaign includes an extensive advertising programme for all sections of the press; the different trade federations have emphasised the value of sultanas to their members; large manufacturers have increased the use of sultanas in their products; food manufacturers have made a special tie-up with their own advertising; catering establishments, canteens and all types of bulk users of food have paid special attention to the recipes incorporating sultanas.

We have received a recipe booklet, poster and display card which is being distributed to grocers and others. All three are well produced and the recipes well selected.

* * *

Food Analysts' Meeting

At a meeting of the Society of Public Analysts and Other Analytical Chemists on Wednesday, May 1, at the Chemical Society's Rooms, Burlington House, Piccadilly, London, W. 1, the following papers were read and discussed: "The Spectrophotometric Estimation of Vitamin A, with Special Reference to Margarine", by J. R. Edisbury, B.Sc., Ph.D.; "The Estimation of Vitamin D in Margarine", by N. T. Gridgeman, B.Sc., H. Lees, B.Sc., and H. Wilkinson, B.Sc., Ph.D.; "The Composition of some Jam Fruits and the Determination of the Fruit Content of Jams" (a communication from the British Association of Research for the Cocoa, Chocolate, Sugar Confectionery and Jam Trades), by T. Macara, F.I.C., and C. L. Hinton, F.I.C.

Food Technology Conference

The Institute of Food Technologists will hold its 1940 meeting at the Morrison Hotel, Chicago, June 17 to 19. This will be the Institute's first annual meeting, organisation having been effected last July at the close of the Second Conference on Food Technology, at Cambridge, Mass. Dr. S. C. Prescott, Massachusetts Institute of Technology, is president of the Institute. Plans for the Chicago meeting are being worked out by a group headed by Dr. E. H. Harvey, Wilson and Co., Chicago.

* * *

Margarine

"Margarine: Its History and Nourishing Values" is the title of an "anti-prejudice" leaflet published by the makers of Stork and other well-known lines, to give the present-day true facts for the benefit of new margarine users.

Production difficulties of the last war, and the many improvements since then, are described. To-day, it is claimed, "good margarine is not a substitute for butter, but an alternative to it—a food on its own".

Details are given of the ingredients used, the manufacture being illustrated by means of photographs taken at the Stork Margarine Works.

Medical evidence on the comparative nutritive values of margarine and butter is given. Figures published by the Nutrition Committee of the British Medical Association show the calory value of margarine as slightly higher than that of butter, while margarine has at all seasons a vitamin A and D content equal to that of butter at its best.

The leaflet is being widely circulated to women's institutes, teachers and members of the nursing profession.

* * *

English Beauty

Apart from their efficiency in business matters, there is certainly somebody in the organisation of Metropolitan Vickers, Ltd., who has the "clinical eye", for from year to year their friends and clients receive a calendar upon which is artistically produced a typical example of English beauty.

While thanking Metropolitan Vickers for thus brightening our office for another year it is perhaps with a shade of regret and a slight feeling of inconstancy that we replace Miss 1939 with Miss 1940. However, slightly misquoting the poet, we might say, "How happy we could be with either, Were t'other dear charmer away."

INFORMATION AND ADVICE

Cherries in Maraschino—Information Supplied

Cherries in Maraschino

6,278. *We should be obliged for any data you have at hand on the subject of the manufacture of cherries in Maraschino. We should also be obliged for details as to the composition of the Maraschino syrup.*

According to the literature, ordinary cherries preserved in syrup flavoured with Maraschino may be labelled "Cherries in Maraschino". The cherries are imported, of course, in a sulphurous acid and salt brine.

The cherries are soaked to remove sulphur dioxide, and as they bleach they have to be dyed, the two colours being Ponceau 3R and erythrosine, or a mixture of both. The latter gives better results, as the fruit dyed with this colour will not "bleed".

Erythrosine dyes the fruit in an alkaline solution, and unless any acid in the fruit is removed or neutralised the colour will precipitate out. It is usually necessary to add at least 7 oz. of baking soda (sodium bicarbonate) for each 100 lb. of fruit and 12 gall. of water, heat a few minutes and add 1 to 1½ oz. of erythrosine and heat to 200 to 205° F. for about 15 minutes and allow the fruit to remain in the coloured water until the desired colour is obtained.

The dye is then "set" by heating the cherries in their coloured solution and adding 1 lb. of citric acid previously dissolved in water and boil for a few minutes and set aside for at least 24 hours for the colour to set properly.

If Ponceau 3R is used, add ¾ to ½ oz. of this dye in about 10 to 12 gall. of water, boil to dissolve the dye, then add the cherries and heat to about 200° F. and hold at this temperature for 15 minutes. Allow them to stand until the proper colour or shade is obtained.

Before starting this process, some wash the fruit thoroughly to remove any colour which may have settled out. Cover the fruit with a 25 per cent. sugar (Brix) solution and add several ounces of liquid citric acid so that the solution remains acid and boil for about 8 to 10 minutes. Set to one side in this syrup and the next day drain and add enough sugar to increase the content 5 per cent. or degree Brix, replace the syrup and continue this method until the fruit syrup tests 65° Brix, when the flavour can be added to the syrup and the cherries are then ready for bottling. Some heat the syrup each time it is added to the cherries, but care must be taken so as not to shrink the fruit.

For safety sake the bottled cherries are pasteurised as follows:

2 to 5 oz. bottles	40 min. at 175° F.
8 ,, ,, ...	50 ,, ,, 178° F.
16 ,, ,, ...	55 ,, ,, 180° F.

Some corn syrup can be substituted in making a syrup, using one part of 44° corn syrup with two parts of cane sugar. But, if used, it must be so labelled.

The following imitation Maraschino flavour can be used at the rate of ½ to 1 oz. per gall. of syrup:

Oil of bitter almond	10 oz.
Benzaldehyde	2½ ,,
Peach extract	2½ ,,
Vanilla extract	1½ c.c.
Oil rose	4 ,,
Oil orange	4 ,,
Oil neroli (orange flavour)	4 ,,
Tincture of orris	1 ,,
Cognac essence	8 oz.
Alcohol	64 ,,
Water to produce	1 gall.

Information Supplied

6,260. *I am very anxious to trace the name of a manufacturer of glass (or otherwise) jars from which air, by means of a hand pump, can be extracted. Food, chemicals, etc., could be stored in them and maintained in a fresh condition, and a few years ago they were marketed by a firm named Pulvac, but they appear not to exist now—I think I have made sufficient enquiries to dispose of them.*

However, I feel that an article such as this must surely exist, and I would like to enlist your services to help me. I sincerely hope that you will be able to give me a positive answer.

The enquirer was referred to a number of likely firms.

6,262. *I should be obliged if you would send me details of the manufacturers of onion-peeling machines.*

The French firm making onion-peeling machinery have discontinued the manufacture for the duration of the war. However, the enquirer was put in touch with an English firm experimenting with such a machine.

6,277. *We should be glad to have details of suppliers of saccharin.*

Names and addresses given.

6,283. *Please inform me of latest methods of filtering animal fats, and supply addresses of firms supplying equipment suitable for this purpose; also addresses of makers of rotary concentric pumps suitable for boiling and semi-solid fats.*

The information was supplied.

6,299. *We should be obliged if you would kindly let us know the name of the firm who are importers and suppliers of "Nulomoline", confectioners' soft sugar.*

The name of the supplier was given.

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RECENT PATENTS

These particulars of new patents of interest to readers have been selected from the "Official Journal of Patents", and are published by permission of the Controller of H.M. Stationery Office. The journal can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, price 1s. weekly (annual subscription £2 10s.).

Abstracts of Recent Specifications

Group Abridgments can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, either sheet by sheet as issued on payment of a subscription of 5s. per Group Volume, or in bound volumes price 25. each.

Margarine Manufacture

In the manufacture of margarine, in prior art processes, a combination of oils and fats and other materials used in the manufacturer's formula are emulsified with cultured milk by churning and reducing the temperature to solidify the fats; then the contents of the churn are generally disposed against either a spray of cold water, which process is known as the "spray process", or poured in a thin layer over a cooling surface, which process is known as the "cold-surface process", and then the margarine is kneaded until it acquires a consistency resembling butter, when it is then moulded and packed.

During these steps in the manufacture much of the flavour, colour, and moisture content of the margarine is lost, and hence further ingredients must be added to supply the same after the "kneading" process. Further, the product is subject to "breakdown", and a grainy or a spotty appearance is often secured. As the process also necessitates contact with the air of the room in which the margarine is made during certain steps thereof, an increase in bacteria is inevitable from the first to the last step in the process. Also, the product is not controllable according to a predetermined standard of consistency, etc.

One of the principal objects of the invention is to provide a process which will yield a more satisfactory margarine in which the mass after the mixture has been emulsified requires no further treatment such as rolling or kneading.

The process consists in forcing the required fluid material into a cylindrical congealing chamber under a pressure sufficient to overcome local back pressures created by bladed means carried by supports upon a rotating drum, the supports being adapted to exert upon the material a pumping action and move the same in a direction opposite to the axial direction of flow through the chamber.

Apparatus for congealing margarine, comprising a cylindrical congealing chamber surrounded by a congealing jacket, in which chamber is rotatably arranged a drum provided with scraping means adapted to contact the inner wall of the chamber and scrape off congealed material depositing on said wall, thereby characterised in that supports for scraper blades on the drum are shaped for creating during the rotation of the drum local back pressures in the material and for exerting on the said material a pumping action by reason of the material being loosened and inwardly driven by the scraping means and for moving said material in a direction opposite to the axial direction of flow of the material through the chamber, the material passing into the chamber at one end of the same under a pressure sufficient to overcome said local back pressures, and passing through the chamber to the other end thereof in a congealed form-sustaining consistency.

514,828. Almond Cooke Routh.

Chocolate Coatings

The primary object is to provide an inexpensive chocolate coating compound that will keep its colour, as against the tendency to develop "sugar bloom", and that will remain relatively firm, without becoming excessively hard or brittle during warm and moist weather.

The process consists in preparing a chocolate compound for coating food articles, in which a sugar syrup containing dextrose is mixed with a fat-containing chocolate, and then, in order to retard segregation and crystallisation of the dextrose, gelatin and gelatinised thin boiling starch are added to the mixture in relatively small proportions.

It has been proposed to substitute an edible, relatively high-melting fat, such as cocoanut butter, for part of the fat contained naturally in chocolate, for the purpose of reducing cost and diminishing the tendency of the compound to soften in warm weather. This substitution, however, due to the fact that the cocoanut fat does not melt at body temperatures, gives the coating an unpleasant waxy taste. This tendency is overcome by using a relatively large quantity of dextrose as the sugar element of the compound, in place of the usual sucrose, which is ordinarily used in smaller amounts. It is possible to use the large quantity of dextrose because of its low degree of sweetness in comparison with sucrose. However, if dextrose alone does not make the coating sweet enough, some sucrose may be used in addition to the dextrose.

To prevent sugar bloom—that is, the development of a greyish colour due to the segregation and crystallisation of the sugar, which appears to have a tendency to come to the surface of the coating—there are incorporated in the compound, according to the present invention, relatively small quantities of gelatin and gelatinised thin boiling starch. The gelatinised thin boiling starch is produced by first treating the starch in the usual manner for making it thin boiling, and then passing the same, in a moist condition, over heated surfaces to bring about gelatinisation. This double treatment of the starch increases the readiness with which it forms a colloidal solution in water. Apparently the starch particles consist of extremely small flakes, which are dispersed very readily and with uniformity throughout the chocolate syrup.

The non-crystallisable syrup such as corn syrup, or other starch syrup, gives softness to the coating and acts to some extent to retard the segregation and crystallisation of the dextrose.

The compound is prepared in a liquid or semi-liquid form, and may be used at once for coating purposes; or it may be allowed to set and afterwards be melted up when required for use, and does not have to be milled.

It is preferable for reasons of economy, and also in order to give the desired firmness and stability to the coating in hot and moist weather, to replace part of the chocolate fat with a higher boiling-point fat. This feature, however, is not essential. It is possible to have some at least of the advantages of the invention if a chocolate with the ordinary fat content of about 52 per cent. is used.

The setting of this coating is due primarily to the crystallisation of the dextrose, as dextrose hydrate, and not entirely or mainly to the setting of the fat, as is the case with ordinary milled chocolate coatings. Hence the coating is less susceptible to temperature changes.

515,430. International Patents Development Company.

Latest Patent Applications

32804. Murray Deodorisers, Ltd.: Method of treating ice-cream mixes, etc. Dec. 22, '38.

32920, 32921, 32922. Rozenbroek, M. D., and Naamlooze Vennootschap Chemische Fabriek Servo. Process for the preparation of starch products. Dec. 27, '38.

2976. Buhler Geb.: Devices for conditioning cereals, etc. Feb. 16.

3146. Erste Bekescsabaer Miskoloer und Debrecener Istvan Dampfmuhlen Akt.-Ges.: Production and working up of a puffed product from wheat. Feb. 19.

Complete Specifications Accepted

Printed copies of the full Published Specifications may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, at the uniform price of 1s. each.

518,118. Grenier, R.: Devices for the treatment and the preservation of cereals stored in silos.

518,103. Niescher, M. F.: Incorporating phosphatides into edible paste goods and bakery products.

517,997. Plews, W. J.: Treatment of soya beans.

518,050. Proctor and Gamble Co.: Manufacture of whipped cream preparations or whipped cream substitutes.